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SCIENCE AND INDUSTRY

Contractors and Engineers Monthly

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PICKS and SHOVELS

By O. E. POTTER

That Precious Cement

In these days of the wide and varied use of portland cement, it is hard to remember that once upon a time, cement was a rare and precious commodity. Portland cement was first manufactured in the United States in 1875 and even then its production was largely experimental. More than a decade later, in 1886, only 150,000 barrels were produced in the United States. Incidentally, this is about the daily production of one of our large present-day cement companies.

C. R. Wightman, Director, Department of Public Works, Benton Harbor, Mich., told an amusing experience of his own in his address at the Twenty-Second Annual Purdue Road School which illustrates the attitude toward portland cement in the early days.

In 1887 Mr. Wightman was employed as Resident Engineer on a bridge over the Spoon River near Knoxville, Ill., for the Santa Fe Railroad. The contractors were Bruce and Barron, two fine Scotchmen from Marseilles, Ill., and consequently most of the employees were likewise Scotch.

The piers and abutments were of coursed ashlar. The stone was quarried in the nearby hills and brought to the site and hand cut and dressed and was laid up with mortar made from Louisville hydraulic cement. The use of German portland cement was specified for pointing purposes only.

Imported cement at that time was packed in wood barrels. A barrel of cement had been brought on the work to point up the finished masonry. A workman opening the barrel by knocking in the head used so much force that when it went in, it caused perhaps a

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A Patching Outfit That I Would Use

A Road Superintendent Looks Around and Offers Some Suggestions For Maintenance Men

WE got to discussing patches with an old-timer the other day—a construction superintendent with seventeen years of experience behind him—and he opened up on us about the time lost in patching state and county roads and the rotten jobs he has seen all too frequently.

L. L. Sanderson, who's had plenty of chance to observe such work, said, "I had

(Continued on page 14)

Material for Dike Hauled by Wagons and Placed Hydraulically

(Photo on page 40)

THE dike of Quabbin Reservoir for the Metropolitan District Water Supply Commission contract, which was awarded to The Arthur A. Johnson Corp. of Long Island City, N. Y., is an earth fill above a concrete cut-off wall to rock, designed by the engineers of the Commission and involving the placing of 2,100,00 cubic yards of earth by hydraulic methods.

The contract for constructing the dam gave a choice of several suitable borrow areas and recommended the use of either

Arthur A. Johnson Corp. Used Hog-Box Method for Building Dike for Boston Water Supply

full hydraulic method by use of mining giants sluicing direct from the borrow pit, or hydraulic placing by the use of shovels and hauling equipment to bring materials to hog boxes from which it was to be sluiced by monitors into gravity lines to the dike. With the permission of the engineers, the contractor devised a layout that centers about the use of one hog box of special design in which the supply of material is controlled by mechanical feeders and the discharge is passed through a dredge pump.

Borrow Pits

Two excellent borrow pits located in the sidehills above the dike were available, one above the east end and the other above the west end of the dike. The contractor took some impervious material from the east borrow pit for use in the core portion of the foundation grading, but secured all of the hydraulic material from the 51-acre west borrow pit. The borrow areas were cleared and grubbed with a minimum stripping as the top soil was wanted in the dike.

The shovel equipment consisted of two electrically-operated Lima 701 shovels of 1¾-cubic yard capacity and

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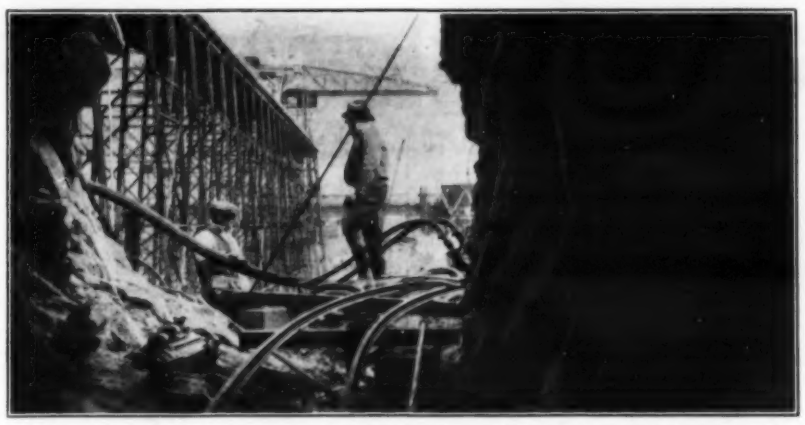


Looking Toward the Concrete-Placing Trestle from the Grouting Tunnel at the West Abutment of Grand Coulee Dam

A Grouting Tunnel Through Base of Grand Coulee Dam Provides Working Gallery to Check Seepage

ONE of the many features of "special interest" encountered at almost every turn when visiting Grand Coulee Dam is the grouting tunnel or gallery, 5 x 7 feet, which will extend through the whole length of the dam, 10 to 12 feet above the contour of bed rock. There will be an extensive network of other inspection and grouting galleries throughout the structure, but this lowest one will serve a particular purpose.

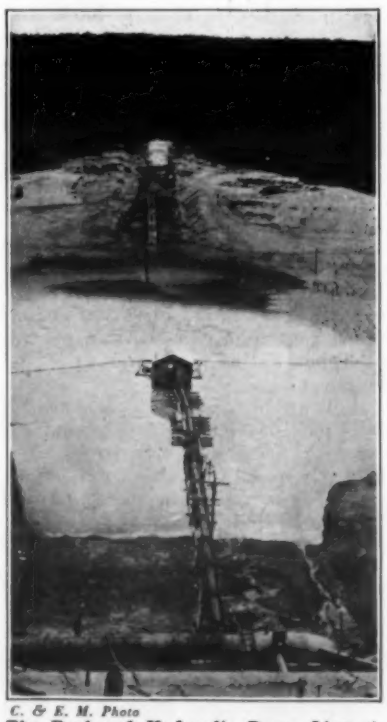
Through the whole length of this tunnel, at intervals of approximately 10 feet, holes 1⅞ inches in diameter will be drilled down into bed rock with diamond drills, taking an up-stream dip of 10 degrees. The holes will vary in depth, from 200 feet to perhaps 500 feet, depending on the character of the rock formation encountered. Into these holes will be pumped a grout mixture of neat cement and water under pressures of 800 to 1,000 pounds per square inch. This grout will then work out into all fissures and spaces in the rock, however minute, and form an impervious screen to seepage, far below the bottom of the dam.

A tunnel is now being dug into the hillside at the west abutment at a considerable distance above the base of the dam. This will connect with the grouting tunnel under the dam proper through a gallery dipping sharply downward. This tunnel under the abutment is 5 x 7 feet which will not only serve for inspection purposes but under which grouting holes will also be drilled normal to the slope.

The grout plant at this west side set-up is situated at the top of a hill and 400 feet of pipe leads from it down to the tunnel mouth at such an angle that the grout comes down by gravity to the agitator and pump. This agitator was made by the contractors, Mason-Walsh-Atkinson-Kier Co., and is similar to the one used at Boulder. Roughly speaking, it is a tub containing a vertical shaft with a propellor, driven by an air motor.

From the agitator, the grout passes to the pump and from there under pressure into the hole, through a 1½-inch line. Valves alone are used to control pressure in the hole, which is to the point of

(Continued on page 15)



C. & E. M. Photo

The Pool and Hydraulic Pump Line at Quabbin Dike

Pile Driver Rig Is Self-Serving

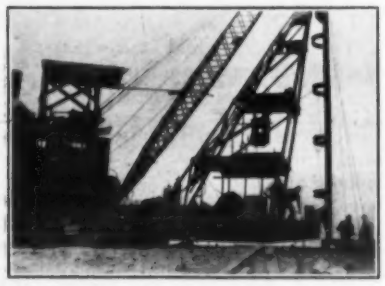
Columbia Construction Co. Used Specially Built Self-Propelling Pile Driver Rig on Jetty Job at Westport, Wash.

By HENRY W. YOUNG

PREPARATIONS for an important piece of jetty work at Westport, Wash., were concluded last March by the Columbia Construction Co., contractor for the spillway dam at Bonneville. This project of the U. S. Engineers, known as the Reconstruction of Grays Harbor South Jetty, is approximately 21 miles from Aberdeen, Wash.

On this job, a rig is being used of the type which has been employed on only two other locations—at the Newport, Ore., jetty, for which the Hauser Construction Co. was the contractor, and three jobs, a total of 7 miles of Columbia River jetty work by Winston Bros. and Guy Atkinson.

These rigs were designed and built by Pace Bros., E. A. and LaFay Pace, and have been patented. The rig shown in the illustration is located at the Grays Harbor jetty, and the finishing touches were being put on the assembly preparatory to starting to drive piles the next day after the picture was taken.



A Pile Driver Cantilevered from a Locomotive Crane

Design of Rig

The rig is designed to build standard railroad trestle over old enrockments or jetties or in any place where it is necessary to carry material on a car behind as the work proceeds. It is therefore self-propelling, the pile driver tower being mounted on an I-beam platform rigidly attached to a steam locomotive crane—in this case an Ohio 25-ton crane. The boom of the crane is left free to operate. The crane can, therefore, swing around, pick up a pile from the car behind, swing the latter out around the pile driver tower and place it in the guides ready for driving. No switching or other facilities for getting the piles around the rig are necessary.

As will be seen, the deck engine is mounted on the floor of the rig under the tower. This is to handle the hammer and is a Lidgerwood one-drum engine. The steam hammer, a McKiernan-Terry 9-B-3, had not as yet been installed on the tower head.

Halfway up the tower is mounted a locomotive-type cross-compound air compressor, manufactured by the New York Air Brake Co. This furnishes air for boring operations in connection with setting drift bolts, anchor bolts, etc.

Steam for the compressor and pile driver is obtained from the boiler of the locomotive crane and is brought forward in an ingenious manner. The pipe for this purpose was just being installed. The canopied superstructure above the crane cab is so mounted that it turns as the cab turns. The steam pipe from the boiler is brought straight up to a

(Continued on page 31)

C. & E. M. Photo

Spreading During the Interval Between Trucks

Heavily-Traveled Road Rebuilt with Cold-Mix

M. A. Gammino Constr. Co. Kept Traffic Moving on 100-Day Job in Putnam, Connecticut

ON June 4, 1935, the M. A. Gammino Construction Co., of Providence, R.I., started a 100-day NRM resurfacing job in the city of Putnam, Conn. This work was ½-mile long and 30 feet wide between curbs and included the construction of a 7-inch concrete base, concrete curbs and sidewalks and a 2-inch 2-course bituminous concrete surface which was mixed in Providence, 34 miles distance, and hauled on schedule for spreading and rolling in Putnam. This NRM Project 36F had one distinct drawback, namely, that the project was on U.S. Route 44, a heavily-traveled scenic highway running direct from the capital city of Connecticut to the capital city of Rhode Island and the contract required that the contractor keep the street open for traffic at all times. This was done with one-way traffic for only one month, during the excavation and pouring of the concrete base.

Grade Preparation

The project adhered to the old grade with a maximum cut of 2 feet which required the removal of a well-compacted oiled top on a waterbound macadam base. A 1¼-yard Northwest power shovel loaded the scarified material into trucks. Some of it was used for the shallow fills where the top was scarified and then the excavated material rolled into the fill.

All of the rolling was done with a 15-ton Buffalo-Springfield gas roller and the material was spread uniformly by a hand labor crew of five men and a foreman, with a Warco one-man grader doing the rough work.

Curbs, Sidewalks and Bridges

While grading was under way, the contractor poured the integral concrete curb and sidewalk, using wooden forms and pouring from a 10-S Rex mixer. Stockpiles were spotted along the road and the mixer fed by wheelbarrows. Two small bridges, one over a power canal, were constructed in a similar manner.

Concrete Base

The same grading crew set the Blaw-Knox 8-inch forms 1 inch below grade so as to give a 7-inch thickness for the base. The batching plant was set up at the Putnam railroad station a quarter mile dead haul from the end of the job, where a Northwest crane with a ¾-yard Williams bucket loaded the bins of the Erie batching plant.

The one and four-batch trucks hauled the dry batches to the 27-E Rex paver which poured in three 10-foot lanes. A Lakewood screed, with hand finishing on widening and intersections, laid down the base to specifications. Considerable difficulty was experienced as all manholes had to be set 2 inches above the concrete base, causing trouble with the screeds. A total of ten men made up

(Continued on page 15)

Supply Highways to Meet Demands

Count Traffic First, Then Build the Roads and Buy Modern Units to Maintain Them

By JOHN BILLETER,
County Highway Commissioner,
Cheyenne County, Nebraska

NO highway should be built that is not justified by the use that will be made of it and the need that requires its construction should also provide for its upkeep. In this brief sketch dealing with the roads in Cheyenne County, Nebraska, and the expansion of these roads into a genuine unified county highway system, it is necessary to take into consideration the development of the county, the character of its soil, and the annual rainfall.

Cheyenne County is out in what is familiarly spoken of as the panhandle or short grass country. It is located in the western part of the state, extending 30 miles north and south and 40 miles east and west, and only a short while ago people thought it fit only for grazing purposes. In fact the population of the entire county in 1910 was 4,551, more than a thousand inhabitants less than it had in 1900. The county has a mean annual rainfall of about 18 inches, which, however, is not infrequently in flood dimensions and of a most destructive sort.

In about 1912 the growing of winter wheat began in a small way and by 1920 the county produced more winter wheat than any other county in the United States. The population had almost doubled by 1920, reaching the total of 8,405 inhabitants; it is now well over 10,000 in population.

The Road System

With this rapid growth in the county in population and farm production prior to 1920, there had been but little done in the way of building good roads. In fact, prior to 1920, there was not a graded road in the county. To-day it is a vastly different picture. The county has more than 900 miles of elevated highways of which nearly 500 miles are graveled. This does not include 78 miles of state and federal highways. Every mile of this highway system is under maintenance. I do not believe in building a highway that for lack of funds cannot be maintained.

County's Equipment

In the construction and maintenance of this highway system, Cheyenne County has accumulated considerable equipment. This consists of six Caterpillar Sixty tractors, six elevating graders, six 12-foot blade graders, one Caterpillar Thirty Tractor, one Caterpillar Twenty, fourteen maintainers, four of which are 2-ton Caterpillars using a pull-type maintainer, one Caterpillar Auto patrol, five Internationals, using Duplex maintainer attachments, three small Case tractors using Whippet pull-type maintainers and one John Deere. Both the Caterpillar Twenty and Thirty are used continuously for reshaping old and run-down grades.

Our equipment is not all of one manufacture nor of the latest type. However, should you visit Cheyenne County, you would find that the county has a unified highway system that is well maintained. Some of our Caterpillar Sixties were purchased as early as 1924, and since that date have built from 10 to 15 miles of roads annually. These are still giving the county good service. All the equipment the county has is paid for as is its highway system. The county has no bonded indebtedness of any kind.

Believer in Traffic Surveys

Personally, I am a confirmed believer in traffic surveys. By a traffic survey I mean that a careful check should be made on a road before building it to ascertain just how many people it will serve. Then build the type of road that may be required, taking into account possible early future development of the community opened up by the road. Unless this is done, one is likely to spend more building the road than the number of users will justify.

In building roads, I have avoided the practice of building a mile here and then another mile somewhere else in the county, unless they connect with good roads. I have been more interested, and I believe rightly so, in always keeping in mind a unified county highway system.

Farm-to-Market Roads

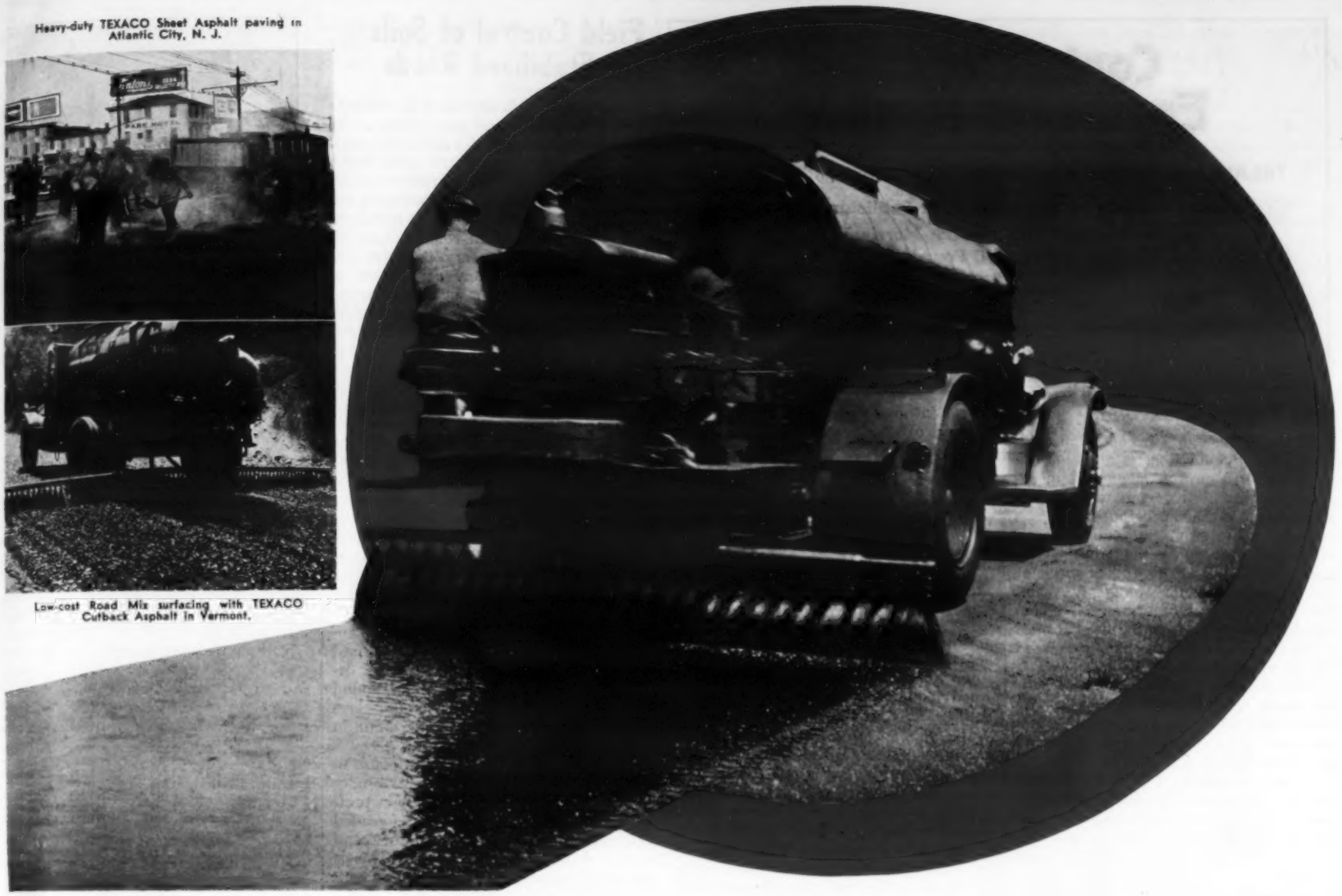
Cheyenne County, at this time, has in addition to its own highway system an excellent state and federal highway system. U. S. 30 traverses the entire county east and west and is hard surfaced the entire route. No. 19 crosses the county from north to south, and both highways are centrally located across the county in their respective directions. The county's road system is well unified with these two highways. I feel now that the time has come that state and federal highway officials should turn their attention to real feeder roads and come to the assistance of counties in an effort to build farm-to-market roads. I do not consider

(Continued on page 33)

The Destructive Effect of a Flood in an Arid District in Nebraska

Heavy-duty TEXACO Sheet Asphalt paving in Atlantic City, N. J.

Low-cost Road Mix surfacing with TEXACO Cutback Asphalt in Vermont.



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TEXACO ASPHALT

TEXACO Asphaltic Concrete paving on Texas Centennial Grounds; building of exhibits still under way when photo was taken.

Securing tough, waterproof mat with TEXACO Surfacing Material in Fulton County, N. Y.

Salvaging old pavement by TEXACO resurfacing in Atchison, Kansas.

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The Sheepsfoot Roller

In the presence of the son of an engineer of a Pacific Coast state highway department, a professor of soil mechanics in an eastern university made the statement that the sheepsfoot roller was invented about two years ago in California, so the report that reached us goes. Having heard his father speak of the sheepsfoot roller for many years, the young man was somewhat taken aback. The story was transmitted at once to the Coast and that is where it came to our attention.

The sheepsfoot roller is now one of our most reliable instruments for the compaction of earth fills. On combination rock and earth fills some engineers prefer the kneading action of pneumatic tires and the push of tractor crawlers but the sheepsfoot reigns supreme on earth. Let us trace backwards some of the history of the sheepsfoot and ask you to add your bit from printed page or memory.

California has perhaps been most prominent in the use of the sheepsfoot roller in the past few years, with other states where earth dams are under construction, such as Ohio, coming close in prominence. There was a contractor named Rohl in California whose reputation for earth dam construction rested largely on the use of the type of sheepsfoot roller which he invented or at least developed at least ten years ago. So we have added eight years to the professor's two.

Looking up its use in the office of an engineer in Sacramento we found that the use of the sheepsfoot roller was specified in Los Angeles City Specifications No. 49 published in 1907, adding another nineteen years to its antiquity. The specifications stated that a tamping roller should be used with teeth 7 inches long and 4 inches square and giving a compaction of 300 pounds per tooth. According to the engineer who was City Engineer of Los Angeles when those specifications were written, the use of the sheepsfoot roller or tamping roller was then common practice.

Now let us go back twenty-seven years when the Editor was a student in the very university where the professor of soil mechanics made the "break" about the sheepsfoot roller. In the course on highway construction the professor, now deceased, told what purported to be the story of the origin of the roller and dated it at an indeterminate year antedating McAdam.

His story told of a farmer who plowed a corner of his field and then went to town on market day. On his return he found the ground he had so carefully plowed to be firm, even solid, it was packed so hard. He made inquiries and found that a sheepsherd, tardy for market, had taken a short cut and driven his flock across the plowed land and after they had passed it was noted that their small feet had packed the ground for a depth of 6 or more inches.

Whether the farmer was the local road supervisor or whether he just gave the information to his friend who held that position is lost in the obscure haze of history. Anyway there was developed almost immediately what was probably the first sheepsfoot roller in the form of large hand-made spikes driven into a log and when the contrivance was rolled over the soft ground of the roadways it compacted the soil from the bottom up.

This is a tale from Merrie England and from California, so let's make it "Bottoms up" to the man who first invented a tamping roller and a salute to those who may add more evidence to the incomplete recollections now at hand.

Hayden-Cartwright Bill Provides Road Funds

The new Hayden-Cartwright Bill, providing Federal Aid for highways for the fiscal years ending June 30, 1938 and 1939, has been signed by the President. This bill also includes an appropriation for secondary roads which is a decided innovation and gives recognition to the value of this type of road.

From the very first, this Bill was sponsored by the American Road Builders' Association and is of paramount importance to the highway industry and profession, as it further stabilizes the highway program, continuing until July 1, 1939 Federal Aid to the state highway departments, grade crossing elimination, forest and national park highways, and adding that group of roads classed as secondary or farm-to-market roads.

This Bill authorizes a total appropriation of $475,000,000 for the two years, providing funds as follows for each of the fiscal years: $125,000,000 for regular Federal-State highways; $14,000,000 for forest highways, roads and trails; $2,500,000 for roads through unappropriated public lands; $7,500,000 for roads in national parks; $10,000,000 for parkways and connecting sections; $4,000,000 for Indian reservation roads; $25,000,000 for secondary and farm-to-market roads; and $50,000,000 for grade crossings.

States are required to match Federal funds for secondary or farm-to-market roads, as well as funds for the Federal-State highways. Hence this program calls for state funds of $300,000,000.

The Agricultural Appropriation Act, which has also been signed by the President, carries a specific appropriation of $60,000,000 for Federal Aid for highways for the budget year 1937, being a part of the $125,000,000 authorized by the Hayden-Cartwright Act of 1934 for the fiscal year ending June 30, 1936.

The U. S. Bureau of Public Roads is now approving projects from the $125,000,000 apportionment authorized for the fiscal year ending June 30, 1937 as rapidly as states are ready to utilize these funds.

The extent of the benefit derived from this legislation depends upon the speed with which work is put under contract, and also upon the faithfulness with which gas taxes and other highway revenues are conserved for road use.

Field Control of Soils for Stabilized Roads

Field control is necessary in order to assure the quality and proportions of the various constituents of a stabilized road. One of the most important items is the selection of suitable soil binder in the vicinity of the project. According to the Highway Research Board's progress report on stabilized soil road surfaces, it is usually not necessary that the soil binder conform to any narrow set of limits, but it is important that complete knowledge of the materials be available.

Soil binder samples should be very carefully selected as experience has shown that the characteristics of borrow pits and subgrades change frequently even in small areas. Examination of a clay deposit overlying limestone in Indiana showed that the clay was deposited in five layers, each of a different plasticity index. It was necessary, in this case, to mix the various clays and determine the plasticity index of the mixture. A check on the soil binder during construction showed that the plasticity index of the mixture was equal to the weighted average index of the various layers.

Each soil having different feel, appearance, color, bedding, etc., should be tested separately. In glacial deposits of clay it is sometimes found that high or low plasticity index clays are formed in pockets rather than in layers.

The engineer should not attempt to determine the suitability of soil binder by visual tests in the field. It is preferable to sample any fine graded material which seems satisfactory and base a decision on test results. This is necessary because some soil binders vary materially in appearance with variations in moisture content. Complete analysis of the aggregate should be made in order that a mix can be satisfactorily designed. From knowledge of the characteristics of the aggregates and soil binder, it is possible to compute very closely the results of any mixture of these ingredients. When a mix has been selected, a sample of the soil binder and the aggregate should be mixed in the proposed proportions in order to determine if the mix as calculated will be satisfactory. In general, if the grading of the mix, and the plasticity index of soil fines are within the limits set up by experience, good results will be obtained.

It is unnecessary to detail the methods of field testing, since information concerning standard test procedure is generally available. It should be mentioned, however, that constant field testing of the binder, aggregates and mixtures is essential for uniformly satisfactory results. These tests should cover the gradation of particle size in both the final mix and its constituents, and the determination of the liquid limit, plastic limit and plasticity index of material finer than the 40-mesh sieve.

Great Britain Plans for Safer Roads, Not New Ones

Most of the resources of the Great Britain Road Fund will be spent on maintenance and improvements, in an effort to adapt existing highways for more convenient and safer transportation.

One of the recent pieces of legislation along these lines was the Ribbon Development Act of 1935, designed to encourage highway authorities to plan the dimensions and lay-out of all important roads on a systematic basis and to enable them to protect the roads from "ribbon" development or the construction of long parallel rows of houses on the sides of main arteries and by-passes. Local authorities were empowered to acquire any land within 220 yards of the middle of a road "the acquisition of which is in their opinion necessary for the purposes of the construction or improvement of the road or of preventing the erection of buildings detrimental to the view from the road."

In February, 1935, the Government announced a five-year program, at an estimated cost of £100,000,000 of which £70,000,000 will be provided by the Road Fund. Highway authorities were invited to submit schemes contemplated for execution within that period. The Government will finance such projects out of the Road Fund up to 85 per cent of their cost instead of 75 per cent as previously. In addition to work assisted by grants to highway authorities, the program includes special arrangements entirely at the cost of the Road Fund to bring certain Class I roads in Scotland up to an adequate standard of construction. The total commitments thus undertaken amounted on November 30, 1935 to about £15,000,000.

Exclusive of the five-year plan are certain long-term schemes already approved, such as the construction of the Severn bridge, at a cost of £2,275,000; the Cromwell Road extension designed to relieve congestion at one of London's main exits, to cost £1,510,000; and reconstruction of Wandsworth Bridge, London, to cost £300,000. The work begun in 1935-36 includes the reconstruction and strengthening of 282 bridges; 600 more are to be modernized between 1936 and 1940.

Great Britain now has 178,607 miles of public highways, of which 26,779 are main traffic arteries, 16,837 miles, secondary routes and 134,891 unclassified, according to the U. S. Bureau of Foreign and Domestic Commerce.

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"How Long Have You Been Workin' for th' Government?"

Many States Plan Use of Cotton for Road Jobs

Thirty-two states are planning the use of cotton mats or cotton fabric for reinforcing in their road construction projects this season, according to a report from the Cotton Textile Institute based on figures from the Marketing Section of the Department of Agriculture. The states and the amount of cotton which they are using are as follows:

State	No. of Mats	Fabric Sq. Yards	Miles of Road (18-foot)
Michigan	2,400	447,975	42.42
North Carolina	2,735	1,115,253.33	105.61
Indiana	1,500	114,060	10.80
Minnesota	4,200		
Missouri	4,200	257,400	24.37
New York	25,400	842,122.21	79.75
Arkansas	1,500	123,000	11.65
Illinois	1,870		
Rhode Island	6,000	125,100	11.84
South Carolina	1,200	669,973.33	63.44
Arizona	920	171,951.50	16.28
Pennsylvania	4,500		
Oklahoma	1,500		
Wisconsin	720		
Georgia	1,000	144,320	13.66
Washington	420	177,077.77	11.08
Nevada	1,250	66,166.66	6.26
Ohio	2,200		
Mississippi	2,100	109,333.33	10.35
California	2,000	66,000	6.25
West Virginia	900		
Texas	20,000		
Oregon	1,000	36,166.66	3.42
Maine		18,186.66	1.72
New Jersey		102,580	9.70
Tennessee		72,092	6.83
Alabama		1,260,094	119.33
New Hampshire		21,706.65	2.05
Virginia		89,173.32	8.44
Montana		39,600	3.75
Florida		54,120	5.12
Massachussets		50,813.33	4.11

Leipzig Fair Dates Announced

The 1,976th session of the Leipzig Trade Fair will be held from August 30 to September 3, inclusive. This Fall Fair will attract exhibitors and buyers from 74 countries and will comprise 6,000 exhibits, making it the largest as well as the oldest industrial exchange in history.

A score of leading producing countries, including the United States, will send exhibits, making possible a preview of the newest products in all industrial fields.

Mercer Advanced by Armco

Harry V. Mercer has been appointed to the newly-created position of advertising manager for the American Rolling Mill Co., Middletown, Ohio, according to a recent announcement by Bennett Chapple, Vice President.

Mr. Mercer has been associated with Armco for 20 years, during 14 of which he has been identified with practically all phases of the company's publicity and advertising. In his new position, he will administrate Armco's program of advertising.

The only permanent thing about a road is the width and plan of the right-of-way, said J. D. Adams, Chairman, State Highway Commission of Indiana.

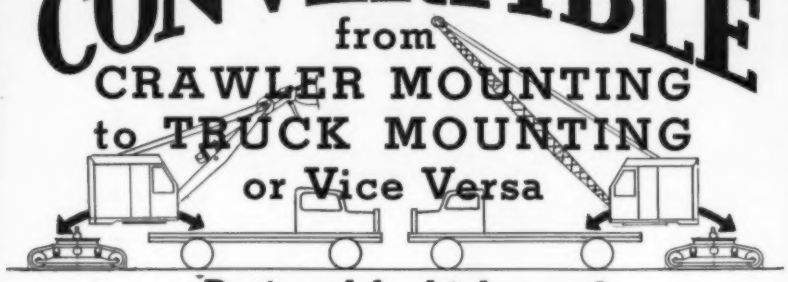
New Sales and Service Branch of Chicago Pneumatic

The Chicago Pneumatic Tool Co., of New York City, has announced the opening of a new sales and service branch at 2415 Commerce Street, Dallas, Texas. D. G. Reeder, District Manager, will be in charge.

The Pittsburgh office of this company is now located at 810 Chamber of Commerce Building, Pittsburgh, Pa.

TWO NEW NORTHWESTS

CONVERTIBLE from CRAWLER MOUNTING to TRUCK MOUNTING or Vice Versa



MODEL 15 — ⅜ YARD CAPACITY

MODEL 18 — ½ YARD CAPACITY

Designed for high speed portability and output!

IN no other machine of ⅜ or ½ yd. capacity are the advantages of the design and construction of larger machines so fully incorporated as on the Northwest Models 15 and 18.

- Simplicity of design.
- Cast steel rotating base—cast steel crawler base.
- High speed gears enclosed and running in oil.
- The Northwest "feather-touch" clutch control.
- Ball or roller bearings on all high speed shafts.
- Cone type swinging clutches.
- Split, demountable drum laggings.
- The patented Northwest cushion clutch.
- Northwest hook rollers adjustable for wear.
- Enclosed worm gear boom hoist running in oil.

Don't buy a shovel, crane or dragline without getting full details. Northwests are built in a range of 15 sizes from ⅜ yd. capacity up.

Mail this Coupon Today!

NORTHWEST ENGINEERING COMPANY
1730 Steger Building, 28 E. Jackson Boulevard, Chicago, Illinois, U.S.A.
Gentlemen: Please, without obligation on my part, furnish me with complete information on the models checked.
Model 15—⅜ yd. capacity ☐ Model 18—½ yd. capacity ☐
Shovel ☐ Crane ☐ Dragline ☐

Name_____
Address_____
Town_____
State_____

Damaged Penna. Bridge Speedily Replaced

When the recent Pittsburgh flood floated away the wooden deck of the bridge over Nine Mile Run the residents beyond were completely isolated, without access by any kind of motor transport until the span could be put back into service. Speed of repair was, therefore, highly essential but it was also necessary that the repair be permanent and adequate to take care of whatever traffic the original girders could accommodate.

A wood floor would be subject to the same hazards as the old, with a comparatively short life and high maintenance cost. A concrete floor would add too much dead weight to the old span and would have required time to construct. The problem was solved by the use of Blaw-Knox-Irving open steel bridge flooring and the permanent repair was effected in three weeks.

This flooring is built of high tensile steel to rigid quality standards. To simplify the design problem it is made in only one combination of size and spacing of carrying members. The variation to adapt this one type to the present-day range of wheel loads is secured by varying the spacing of the supporting joists and stringers. The arrangement of longitudinal carrying members and transverse spacing members is carefully designed for safety not only of wheeled traffic but also of horse and other draft animals.

The longitudinal members are 2½ x 3/16-inch of a steel having a yield point of 47,000 pounds. They are spaced on 2¼-inch centers. The spacing members are 1¼ x 3/16-inch and are riveted to the longitudinal members at every intersection.

The floor is delivered to the bridge in units approximately 25 inches wide by 25 feet long. The ends of the longitudinal members are staggered two spaces of the transverse members and are offset 6 inches from the end so that the lap joint rivets together, making the grid continuous for as long a distance as desired. The joints between adjacent sections are made by riveting the longitudinal bar side of one section to the transverse bar side of the adjacent section as the floor is laid. Thus, when the floor is finished, the joints of the longitudinal members are the only ones that are apparent, the others being the same as the joints between the factory-assembled parts.

The New Deck of Nine Mile Run Bridge Nearing Completion

The floor is built for modern highway bridge specification loadings, and tables are available to show what joist spacing should be used for each weight of rear wheel. Sizes and spacing of ma n stringers, panel length arrangement, floor-beam sizes and all such general features of the design are still at the discretion of the designing engineer and any combination he may select for a new span or find existent on a span to be repaired can be used without change.

New Sprinkler-Sweeper

An addition to the line of Universal road sweepers has recently been announced by the Frank G. Hough Co., 919 No. Michigan Ave., Chicago, Ill. This new unit is the Universal-Hough Sprinkler-Sweeper, which can be pulled by any small tractor or truck and sweeps to the right or the left. It is powered by its own engine which operates the brush as well as a rotary gear pump for supplying the water pressure. Its tank holds 200 gallons of water which is sprayed ahead of the brush. The machine will sweep without raising any appreciable dust at the rate of 5 to 6 miles an hour, according to the manufacturer. Each filling of water is sufficient for from 8 to 10 miles of sweeping.

Complete details on this new unit may be secured by contractors, state and county highway engineers direct from the Frank G. Hough Co.

The New Universal Road Sweeper

New V. P. for Allis-Chalmers

L. W. Grothaus was recently elected Vice President of the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Grothaus has been associated with the organization for 32 years, serving in various positions, the most recent being Assistant to the President since 1933.

BUYING A PUMP?

INSIST ON:

- Faster, 100% Automatic Priming,
- Greater Efficiency in Any Size, at Any Lift,
- Thousands of Hours of Heavy Duty Service.
- Cut Your Costs with "Sure Prime" Pumps—2" to 10" Sizes, Capacities 7000 to 200,000 G. P. H. Send for New Catalog and Prices.

THE JAEGER MACHINE CO.
701 Dublin Ave., Columbus, Ohio

JAEGER

KOEHRING

251

5/8 yards

KOEHRING HEAVY DUTY

Fast Operating Speeds — and light weight—two selective swing speeds and two travel speeds — only a few of the many outstanding operating features of the new Koehring 251.

Enclosed Gears — Anti-Friction Bearings — Heavy Duty Welded Construction—Koehring Chain Crowd, Positive Steering, Powerful Traction. The 251 is available as a Shovel, Crane, Dragline or Trench Hoe. Write for bulletin.

KOEHRING COMPANY
Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

Hard Rock Tunnel For Intercepting Sewer In New York City

(Photos on page 40)

AT the junction of East End Avenue and 89th Street, New York, on the East River waterfront, the Rosoff Tunnel Corp. put down Shaft No. 1 of a series of seven for completing its $4,500,000 contract with the Department of Sanitation. This is part of the $25,000,000 program for the construction of interceptors from the notheastern part of Manhattan and the southwestern section of the Bronx and the completion of the Wards Island Sewage Treatment Works. In a high class residential neighborhood the problem of keeping noise, traffic and vibration at a minimum was important.

Eliminating the Nuisances

As one means of reducing noise in this residential district, the contractor housed the compressors and other power equipment in substantial buildings in a compact yard at the junction close by the shaft. Evidence that noise has been reduced to a minimum is found in the fact that Raymond Moley edits *Today* just across the street from the contractor's yard and the shaft where all of the activities of this particular section centers. The hoist on the shaft head frame is equipped with a fibre gear to reduce noise and all other equipment used on the job operates unusually quietly. The shaft is screened with a timber barrier and baffles to deflect noise away from the adjacent buildings.

Traffic interference is held to a minimum by dumping as much of the spoil as possible from the shaft, and from such open trench excavation as is necessary, inside the pier headline and alongside Carl Schurz Park through an arrangement with the Park Department. This made it necessary to have fewer trucks in the vicinity, shorten the haul and made a new park area available to the Park Department. As mucking of the tunnel is periodic, the heavy trucks are brought in only when muck is being delivered from the shaft.

In driving the shaft, vibration and noise were held to a minimum by using light shots and covering with heavy steel mats. Light shots are also used in the tunnel and in order to determine the jarring which might be caused by blasting in the tunnel, as well as to prevent damage suits, the contractor places a portable vibrograph in the basement of the nearest building as each round is fired, thus keeping a graphic record of vibrations caused by the subterranean blasting.

Driving the Shaft

Shaft 1 at 89th Street and East End Avenue was driven through 15 feet of top soil and then through solid rock. From the shaft south to 81st Street and Marie Curie Avenue, the tunnel is all in rock. Extending west on 89th Street it was expected that rock would be encountered throughout but most of the block between East End Avenue and York Avenue was taken out as open cut.

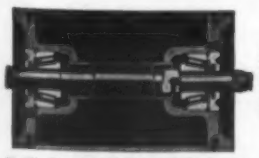
The shaft was driven 22 x 60 feet in area and the top 15 feet of soil was clammed out with a Blaw-Knox bucket and a Northwest heavy-duty crane loading to the contractor's own Mack trucks. Spoil was hauled to Riverside Drive, a distance of about 3½ miles, or dumped at Carl Schurz Park.

Air for rock drilling in the shaft as well as in the tunnel was furnished at 100 pounds pressure by a Sullivan 550-foot electrically-driven compressor located in the yard. For the shaft six Worthington heavy sinkers were used which were later converted and mounted

(Continued on page 11)

Noise and Vibration Reduced to Minimum in Residential Area by Rosoff Tunnel Corp.

The Drill Carriage on a Siding and the "Cherry Picker"



Adjustable bearings locked into pulleys take radial and thrust loads. Furnished with either Ball or Roller Bearings.

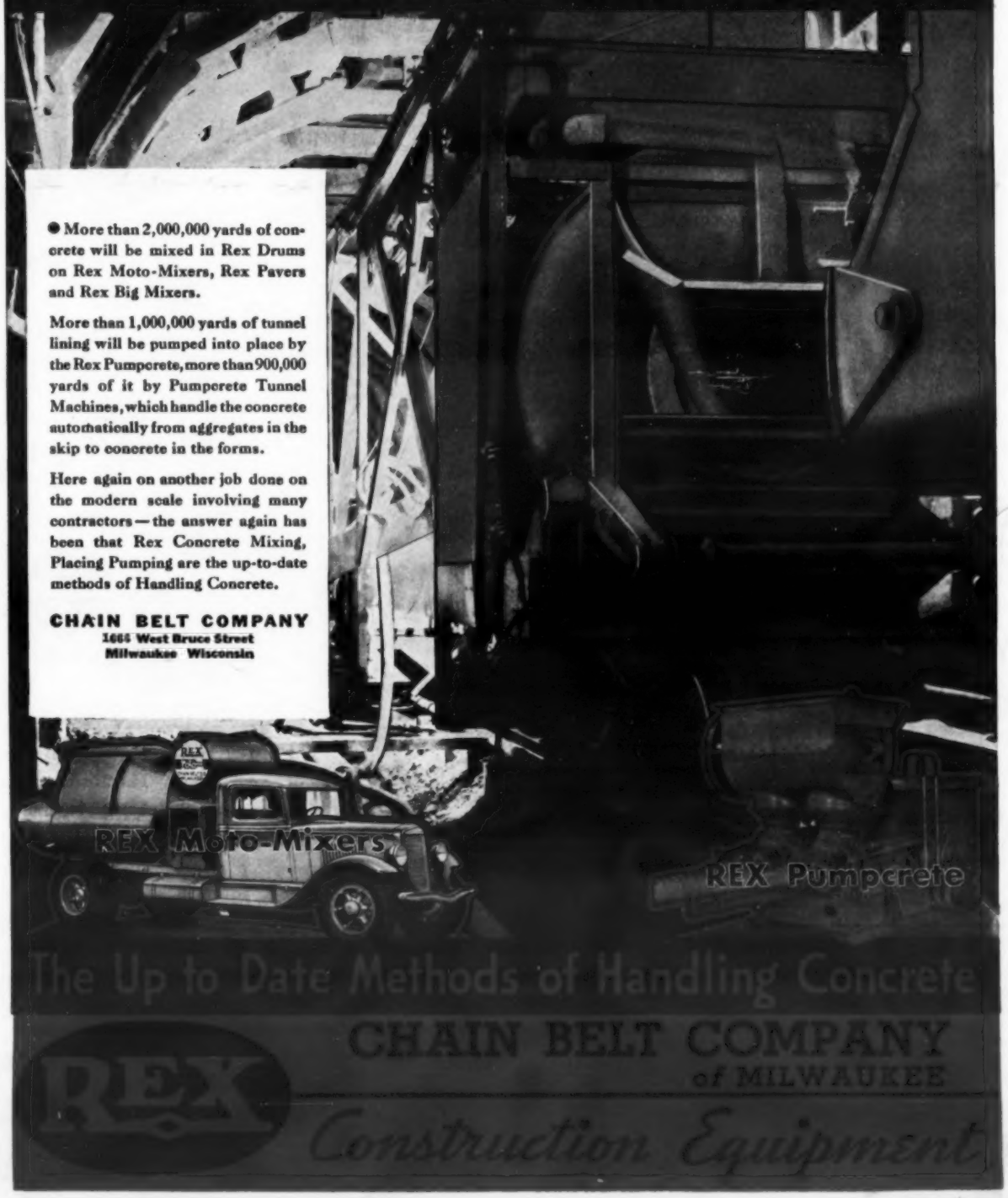
"CONWEIGH" Trougher No. 25

Conweigh presents an advanced design which provides the ultimate in economy performance and service . . . Write for new Catalog describing the complete Conweigh Line . . . Our line of Portable and Semi Portable Conveying equipment is described in our Catalog of "Porta Conveyors."

PORTABLE MACHINERY CO.
Division of A. B. Farquhar Co., Limited
BOX C-1, YORK, PA.

In the Metropolitan Water District

More than 2,000,000 Yards Will be Mixed in Rex Drums . . .
1,000,000 Yards More will be Pumped by the Rex Pumpcrete



● More than 2,000,000 yards of concrete will be mixed in Rex Drums on Rex Moto-Mixers, Rex Pavers and Rex Big Mixers.

More than 1,000,000 yards of tunnel lining will be pumped into place by the Rex Pumpcrete, more than 900,000 yards of it by Pumpcrete Tunnel Machines, which handle the concrete automatically from aggregates in the skip to concrete in the forms.

Here again on another job done on the modern scale involving many contractors — the answer again has been that Rex Concrete Mixing, Placing Pumping are the up-to-date methods of Handling Concrete.

CHAIN BELT COMPANY
1665 West Bruce Street
Milwaukee Wisconsin

The Up to Date Methods of Handling Concrete

REX CHAIN BELT COMPANY of MILWAUKEE
Construction Equipment

Building a Road with Common Salt

Highway Research Board Issues Second Report on Stabilization Covering Ways of Constructing Proper Soil-Aggregate Roads

THE practical utility of stabilized road construction has been demonstrated, according to the Project Committee of the Highway Research Board on Stabilized Soil Road Surfaces, which has recently issued its second progress report on that subject.

Most of the experience available for study in preparing this report was with surface treatments, and from this experience the Committee has made the following recommendations for this type of construction.

Construction Features

Preparation of the subgrade is one of the most important items to consider. The soil-aggregate mixture can be very satisfactorily placed on a new grade which has been rolled until firmly compacted. All soft spots must be located and remedied. In many cases soft and spongy sections are due to moisture-bearing strata which intersect the grade line. In cases of this nature, it is necessary to investigate the area thoroughly by means of soil augers or post-hole diggers. It is important to divert the water by intercepting drains before it enters the grade rather than to drain it from the soft spot after the damage has been done.

When for any length of time the water table is near the stabilized base, there is possibility of failure due to softening of the road bed. Such a failure will also affect the stabilized course, especially if the percentage of soil fines is high. It is necessary in cases of this kind either to lower the water table by drains or ditches, or to provide a fill of suitable height to insure firmness during the entire year.

On most newly-constructed grades, rain will enter material which has not been thoroughly consolidated and soft places will develop. These places can be excavated, drained, backfilled and compacted with suitable materials or, where possible, a firm base may be constructed by working additional aggregate into the subgrade.

On old gravel or stone roads, the matter of providing a compacted base has usually been well-taken care of. Old roads which have been compacted over a period of years should not be scarified down to the sub-base but merely given a light leveling in order to provide a uniform base.

It is not practicable to place stabilized material over old oil mats or bituminous surfaces since a seal is interposed between the sub-base and the stabilized course. There is, therefore, no opportunity for the small amount of moisture needed to maintain the stabilized material in a slightly damp condition, to enter from beneath the bituminous course. Experimental sections placed over old bituminous surfaces have potholed badly due to rapid drying during periods of dry weather. If the bituminous surface is good enough for further use, it should be repaired. If it is badly broken up and beyond repair, it is possible to scarify the road deeply enough to break the bond of bituminous material, add soil binder and stabilize, using the old material for aggregate.

Scarifying a Road in New York State with a York Rake Preparatory to Salt Stabilization

Mixing Methods

A number of different methods have been used for placing stabilized materials, of which the road-mix is perhaps the most common. John H. Barr reports the following practice used in Oakland County, Mich.

"It has been found convenient to work each project in half-mile sections, and the method used is as follows: all loose material on the roadway is windrowed to the center. Enough new material is added to the windrow to bring the total

(Continued on page 22)

WRITE FOR CIRCULAR on the

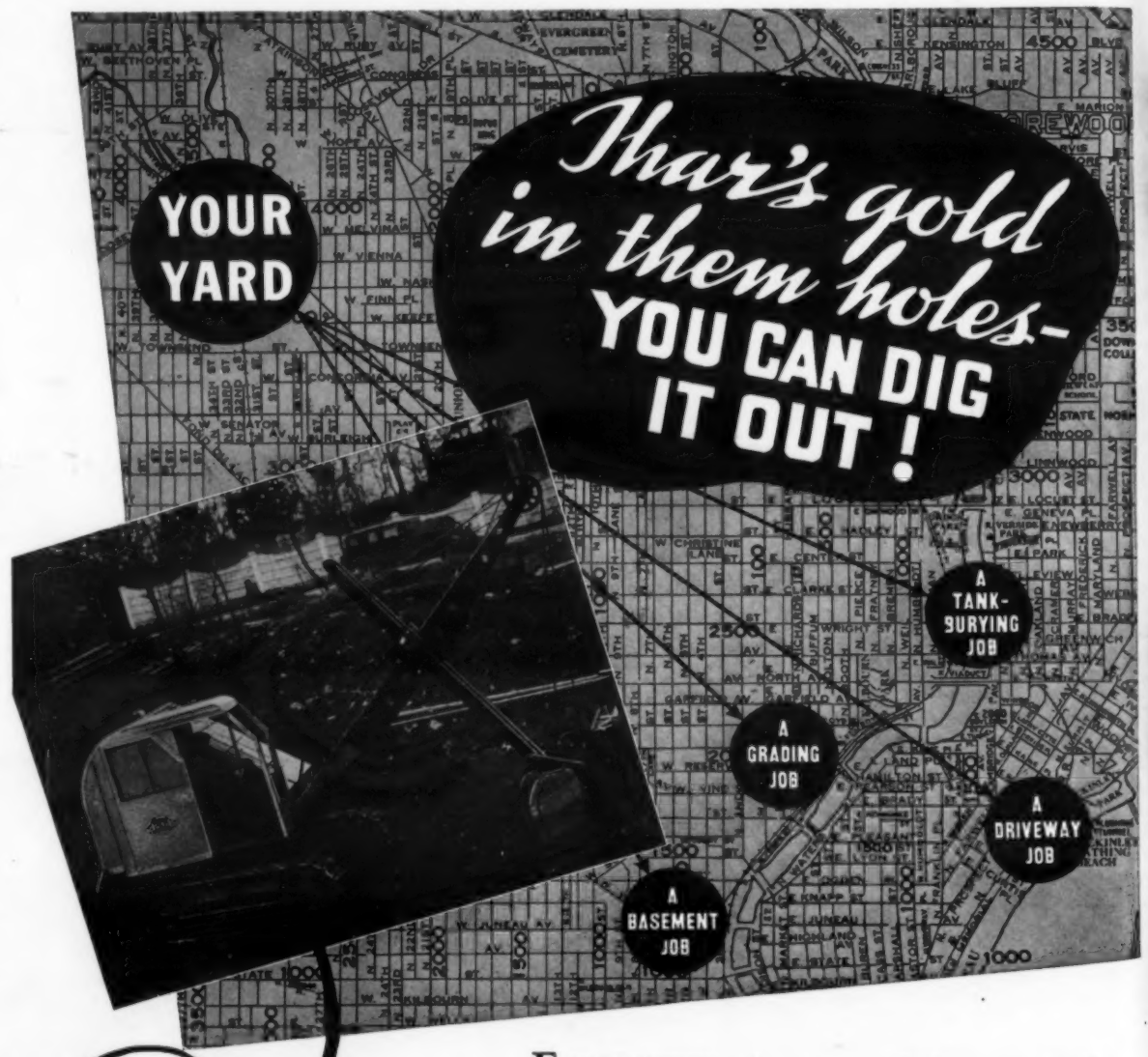
South Bend

MODEL 200

BITUMINOUS MATERIAL DISTRIBUTOR

—Applies 1/10 to 3 gallons per square yard
—Distributes any width up to 22 feet
—Has a rated capacity of 300 to 2000 gallons
—Can be mounted on any truck or trailer

MUNICIPAL SUPPLY COMPANY
SOUTH BEND INDIANA



Weighs less "on its shoes." That means less shoring to get out of excavations . . . less damage to roadways and curbs.

EXCAVATING profits come from digging . . . not traveling. The faster you can get from job to job, the lower your costs will be, and the higher your profits. That's truer today than ever before, for 1936 is a small job year. ● Grading jobs, basement jobs, land clearing jobs—the kind of jobs the Bantam-Weight is built for. It's light and easy to move. You can take it many a place where heavy machines are prohibited. ● And once on the job its fast cycle, its sturdy V-8 motor, its ability to work in tight places make it a real producer. Get a Bantam-Weight and go after the real money in small jobs.

HARNISCHFEGER CORPORATION
4419 W. NATIONAL AVE. *Established 1884* MILWAUKEE, WIS.
Warehouses and Service Stations: Hoboken—Memphis—Jacksonville—Seattle—Dallas—Los Angeles—San Francisco

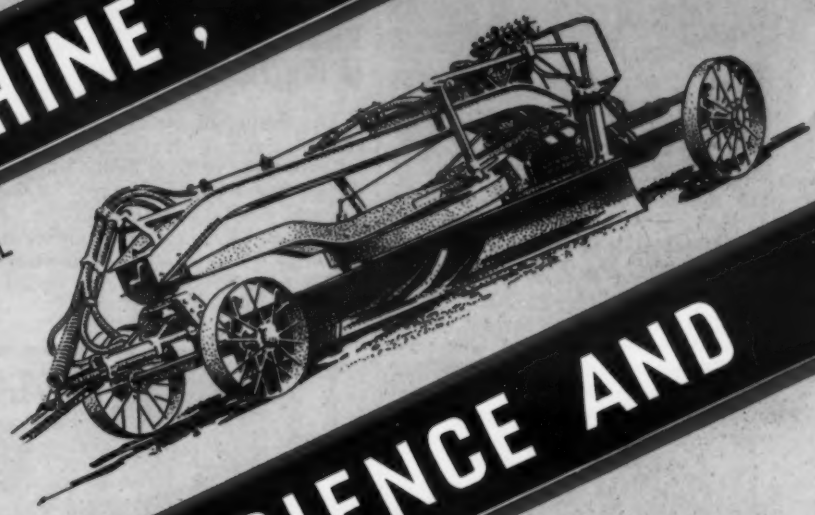
P&H BANTAM WEIGHT
FIRST TO THE JOB — AND FIRST THRU
ONE OF THE 22 P&H PACEMAKERS FOR 1936

GALION

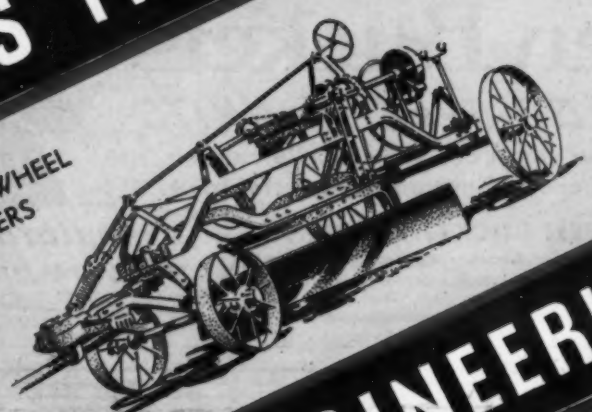
MOTOR GRADERS

HAS THE RIGHT MACHINE, BACKED BY

LEANING WHEEL GRADERS

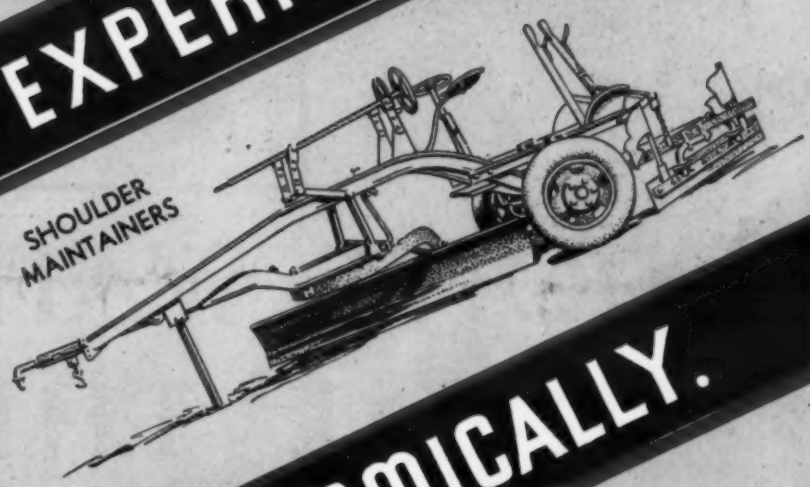


STRAIGHT WHEEL GRADERS



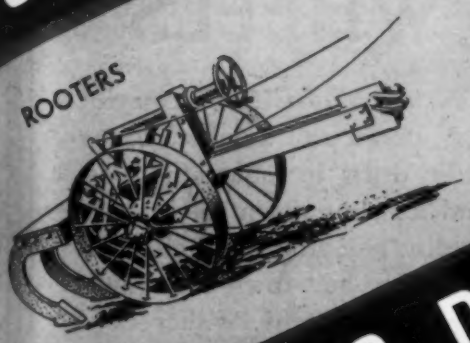
SOUND ENGINEERING EXPERIENCE AND

SHOULDER MAINTAINERS



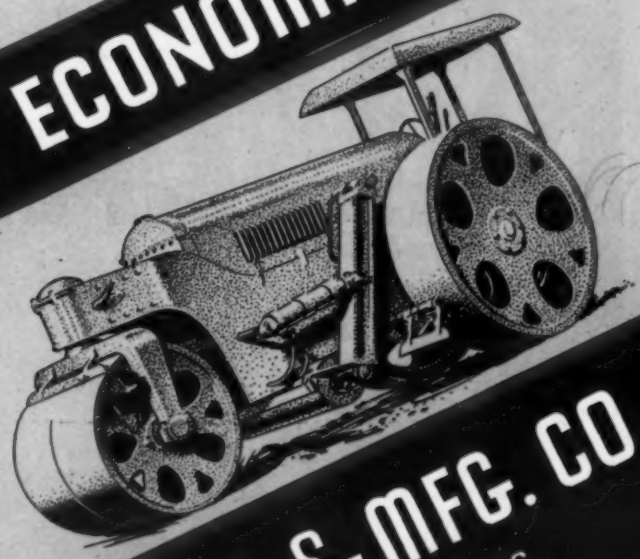
SPREADERS

ROOTERS

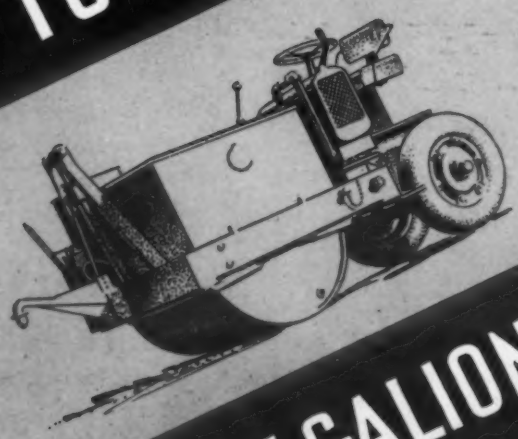


DESIGN, TO DO YOUR JOB ECONOMICALLY.

ROAD ROLLERS



PORTABLE ROLLERS.



THE GALION IRON WORKS & MFG. CO.

DISTRIBUTORS IN PRINCIPAL CITIES

GALION, OHIO

The Hyb-Lum Aluminum Wheelbarrow

Aluminum Wheelbarrow Increases Pay Load

The Hyb-Lum wheelbarrow, made from a high-strength nickel aluminum alloy, is claimed to increase the pay load 15 per cent by the reduction in dead load through the use of the light-weight material in its construction.

This wheelbarrow, made by the Sheet Aluminum Corp., 701 Liberty St., Jackson, Mich., comes in two sizes, of 2½ and 4½ cubic feet capacity. The pan and structural-type frame are made of aluminum alloy, reducing the total weight 40 pounds. Both models are equipped with heavy-duty Goodyear pneumatic 4 x 14 tires which give balance and eliminate shock.

According to the manufacturer, conservative figures reveal that the cost of hauling with wheelbarrows is from $2.40 to $3.20 per ton-mile. Through the service of the Hyb-Lum wheelbarrow, it has been shown that the cost of the barrow may be saved in from 30 to 60 days because of the increased pay load. In addition to this, the use of the pneumatic tire eliminates the use of planking or temporary runways in many cases. To these factors may be added less fatigue in the operator.

Complete details on these wheelbarrows may be secured direct from the Sheet Aluminum Corp.

Radical Change in Design of Big Tilting Mixers

The feature of the new Smith tilting concrete mixers is an arrangement whereby two, three or four Smith tilters can discharge into a central hopper by charging and discharging through the same drum opening, instead of having separate openings for charging and discharging as has been the conventional design of mixers. The manufacturer, T. L. Smith Co., 2857 N. 32nd St., Milwaukee, Wis., claims that by this new arrangement a more compact mixing plant set-up is provided. Only one set of batchers is required to charge all mixers and a material saving may be effected in the overall height of the mixing plant.

The mixer has an automatically-operated feed chute which seals the drum opening and permits the batcher turn head to be moved to the next drum immediately after the drum is discharged. The flow between batcher and mixer is practically in a straight line, allowing the aggregates to enter the drum faster. Displaced air escapes through the other drum opening. Since the mixer has a feed chute which seals the drum opening, and which prevents spilling unmixed aggregates into the concrete hopper, it is not necessary to back-tilt the mixers excessively to insure fast charging. The drum of this Smith front-end charged mixer is virtually in a horizontal position.

The New Smith Front-End Charged Mixer

Four Smith 84-S front-end charged mixers are pouring the Tygart Valley Dam now under construction by the Frederick Snare Corp. This is the first front-end charged mixing plant ever installed and has been in operation over a year. Three of the Smith 112-S mixers which were used at Boulder Dam have been arranged for front-end charging by the Columbia Construction Co. for service at Bonneville Dam.

100 STANDARD BUCKETS..

Type "D"

OWEN HAMSHELL BUCKETS

Owen Buckets

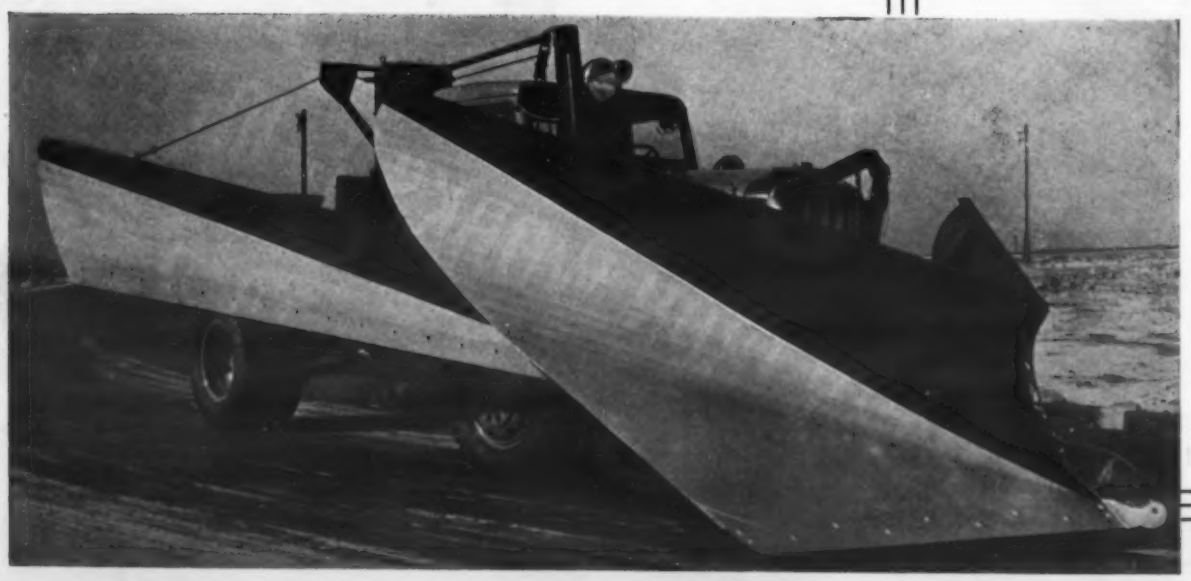
..100 SPECIAL UNITS

We'll show you a bucket to handle any job, or design one and guarantee its performance.

THE OWEN BUCKET COMPANY
6030 Breakwater Avenue • Cleveland, Ohio
Branches: NEW YORK • PHILADELPHIA • CHICAGO • BERKELEY, CAL.

A mouthful at every bite

DON'T WAIT UNTIL THE BLIZZARD hits!



Investigate Now

"DYNAMITE ON WHEELS"

Every phase of Walter Motor Truck construction spells strength, power and traction. Plunging through terrific drifts in mountain passes, scraping snow and ice clear down to the pavement in city streets, plunging through hard-packed drifts on county and town highways—that is why Walter Snow Fighters are called "Dynamite on Wheels."

•

Four Point Positive Drive—100% Traction

•

WALTER MOTOR TRUCK COMPANY
1001-19 Irving Ave., Ridgewood, Queens, Long Island, N. Y.

Hard Rock Tunnel for N. Y. Sewer

(Continued from page 7)

on a drill carriage, having four drills, for use in the headings. Timken 2½-inch and smaller detachable bits were used on the shaft and Crusca 2½-inch and smaller detachable bits are used in the headings. Air for the drilling is carried from the compressor to the shaft, down the shaft and through the tunnel in a 6-inch pipe.

The earth excavation was sheeted with 3-inch sheeting and 12 x 12 rangers and bracing, the sheeting being driven to rock with a McKiernan-Terry air hammer. When rock excavation started in the shaft it was line drilled at the outside edge to subgrade in one operation, a distance of about 20 feet. The balance of the rock was drilled with lifter holes 6 to 8 feet in length on a 45-degree slope and some 60-degree holes. Light shots were used and all blasting was done under heavy steel mats. The shaft was carried down level instead of pushing one section ahead.

Starting the Tunnel

Tunneling was started at once before the head frame was erected. All mucking in the tunnel was first done by hand loading to a skip on a flat car and then hoisting out by the Northwest crane. When the tunnel had been driven 75 to 100 feet in either direction by hand, the head frame was erected and a Conway mucker and an electric trammer and cars installed.

The head frame is made of 10 x 10 verticals well braced and carries a 2-yard skip made especially for the job and both welded and riveted. It measures about 8 x 4 feet in plan and its operation is entirely by push button control from the top of the tower. One man, located on a platform at the top where he can see the skip as it emerges and watch it dump into the muck bin, is responsible for the skip operation and dumping the bin into the heavy-duty Mack trucks as they pull alongside the head frame. The gate on the muck bin is operated by a pneumatic ram or piston. The skip is operated by a Clyde hoist with fiber gears driven by a General Electric motor. Limit switches at both top and bottom prevent accident in the operation of the skip.

Driving the Tunnel

In spite of the fact that the tunnel floor is 12 feet below mean high water and the East River is only a few hundred feet distant, the water in the tunnel is practically all ground water. It is removed by 4-inch La Bour centrifugal pumps mounted in the shaft.

In sinking the shaft, the working hours were controlled somewhat by the residential character of the neighborhood. Starting at 6 in the morning, the crews would drill and shoot for 12 hours and then drill for 6 hours on the night shift and shut down at midnight, opening up again at 6 in the morning. When the tunnel was started and hand mucked, three 6-hour shifts were operated, and blasting was confined to the 12 hours between 7 in the morning and 7 at night when the fewest people are in the residential buildings adjacent to the work. After April 1 blasting was done at any convenient hours.

Progress on the first few hundred feet of the tunnel section of this 5-foot 3-inch by 4-foot 3-inch horseshoe sewer averaged about 20 feet per 24 hours but was soon increased to about 30 feet per 24 hours, with a maximum progress of 36 feet in 24 hours. Drilling and shooting takes but two hours and mucking two hours so the drill outfit helps clean out the headings. On each shift there are four drillers, two chuck tenders, one powder monkey, and one nipper or steel runner. There is an operator on the No. 20 Conway mucker and a lead man who handles the electric cable.

Mucking

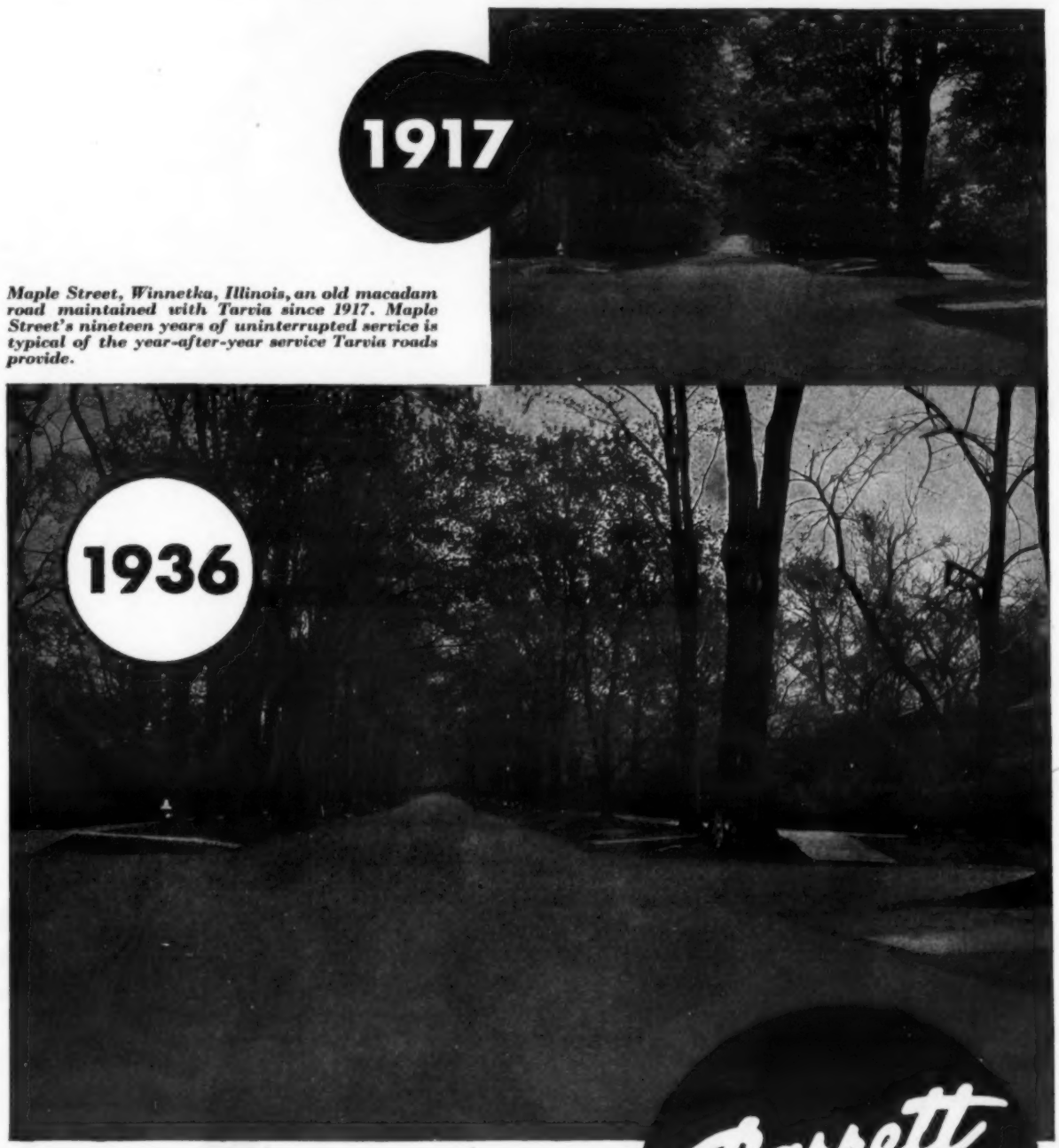
A 4-ton Mancha electric-battery-operated locomotive and ten 1½-yard Koppel cars haul the muck out of the tunnel. The method of loading and handling empty cars by means of a cherry picker located from 60 to 100 feet back of the mucker is of interest. Considering the cars numbered from 1 to 10 beginning at the locomotive which is at the far end of the train from the mucker, No. 10 car is placed immediately behind the mucker. The cherry picker takes off the empty No. 9 car and the train goes ahead until No. 8 car is coupled to No. 10 car which has been filled. The train is pulled back and the cherry picker puts No. 9 car, which is empty, at the end of the train which takes it up to the mucker and then returns and the cherry picker takes No. 8 out of the train. This is repeated

(Continued on page 21)

BIG PRODUCTION—LOW COST

This fast, portable, easily operated Trackson tractor-shovel digs and loads up to 40 cubic yards per hour —WITH ONLY ONE MAN. 7-foot dumping clearance. Wide range of usefulness—digging, loading, subgrading, stripping, cleaning up, bulldozing, leveling, excavating. 3 heights, crawler or wheels, ½- or ¾-yard buckets, bulldozer attachment. Write for Catalog C-76 to Trackson Company, Milwaukee, Wisconsin, U.S.A.

TRACKSON HIGH SHOVEL



Maple Street, Winnetka, Illinois, an old macadam road maintained with Tarvia since 1917. Maple Street's nineteen years of uninterrupted service is typical of the year-after-year service Tarvia roads provide.

The time and money economies of Tarvia extend to every branch of road-building and maintenance activity. There is a grade of Tarvia and a low-cost Tarvia method for every type of highway work. Tarvia roads are uniformly smooth, easy-riding, skid-safe—modern in every particular, and need only the simplest, most economical maintenance to keep them that way indefinitely. The Tarvia field man will gladly give you the details. Wire or write our nearest office.

Barrett

TARVIA

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Special Equipment
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AS WELL AS
FIRST
IN SALES

P L L A R

"Caterpillar" Tractor sales are greater than the combined sales of all other track-type tractor manufacturers. The experience of the tens of thousands of owners proves "Caterpillar" Service is also first.

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5 Distributors ship 90% of all parts orders within 24 hours.

This complete service is designed to keep every "Caterpillar" Tractor working—that's why every SHOW-DOWN shows "Caterpillar" first. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

Old Timer Suggests a Patching Outfit

(Continued from page 1)

occasion to be in the office of a Highway Commissioner in northeastern Wisconsin about 5:30 one evening when a number of his men dropped in and discussed the work of the day, which had been the patching of a low spot on a concrete pavement some 30 miles south of the highway shops. This was in September of last season and the material which they were using for patching was an asphaltic oil binder with crushed stone, used to make a penetration patch. There were several strips the men were working on, one about 30 feet long and one approximately 20 feet. The Commissioner was quite displeased with the work and said quite emphatically that 'better work has got to be done on that patching job, or some of you fellows will be looking for a new place'. The whole thing seemed to hinge around the unevenness of the work. It finally developed that they had no roller on the job. The roller was some 15 miles north of the shop, making it about 45 miles from the job. No one cared to drive up north for the roller and drive it back to the site of the job because of the four or five hours of rather tedious work involved, and the patch suffered accordingly."

Sanderson continued by saying that he drove by the location of the patching work on the concrete the next morning. It was almost noon and he saw that the roller was on the job, so maybe no one was fired after all because of the poor patch. As he drove along he recalled the number of pieces of equipment he had seen at the site of the work and which had been brought there for completing a 1 to 1½-inch bituminous patch, totaling in all about 50 running feet by 18 feet in width. The equipment included one bituminous distributor, one 3-ton truck to haul the stone, one 5-ton self-propelled roller, and the indirect equipment such as the gondola car of binder stone some 30 miles away and a steam boiler running 24 hours a day to keep the bitumen in a fluid state so that it could be handled.

"I am not an advocate of things in general which would have a tendency to decrease man-hours," said Sanderson, "so I'll make no specific issue of the number of men involved, other than to state that I counted six on the job, and one on the car would make seven. The total investment, as represented in the equipment, would run roughly to $6,500. Of course, this was all regular equipment which the county owned and used in its road construction program, but, just the same, it all had to be utilized for several days on this minor work, and a total of 210 miles had to be covered to execute the job. I am taking here the mileage which each of the three pieces of equipment had to travel to get to the job and back to its respective location."

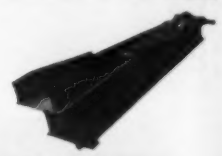
The more he thought of this particular job the more he was convinced that cases of this nature occur all over the country from time to time and he said he knew that "by putting two and two together," a complete and practical patching outfit could be assembled as one unit by the simple process of combining and using new materials and economically-priced equipment which is on the market today and available from a number of sources.

How About a Pre-Mix Plant?

We asked Sanderson about a county having a pre-mix plant at its highway shop, hauling the material to the job, spreading, raking, leveling and rolling it, eliminating the use of a distributor. He pointed out that this still required the roller which after all is a slow-moving unit at best, making it more or less of a problem for patching work. Using a pre-mix for patching presents difficulties not ordinarily experienced when penetration patching is used. Pre-mixing in advance, say, a month or more prior to usage, causes the stockpiled material to dry out considerably on the outside, with the result that if some of this dry mix is used in patching, the bond is none too good. The practice of pre-mixing just prior to use involves a lot of detail which is not necessarily a part of penetration patching. Freshly mixed material, particularly when it contains a percentage of fines, sets slowly. Practically all patching is undertaken when traffic is more or less continuous. In some instances a patch may be in only ten minutes before traffic is running over it. Very few road or street workers care

(Continued on page 28)

Get CLEAN SAND and GRAVEL with EAGLE WASHERS



Screw and Paddle type machines to meet particular washing and cleaning problems in sizes to suit capacity requirements. Send for bulletin W2 for complete information.

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LOW COST AIR . . . WHEREVER NEEDED

Precision equipment, necessary to the building of LeRoi Engines, is used in the construction of LeRoi-Rix Air Compressors. Such precision construction results in better air compressors . . . compressors with lower operating costs, less maintenance expense, and longer service life . . . features which assure lower "air" cost to you.

LeRoi Air Compressors are available in all mountings, single or two-stage, portable or stationary. The catalog gives complete information; write for your copy.

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Builders of LE ROI ENGINES AND GENERATOR SETS

Valve-in-Head Engine offers lower fuel consumption—greater accessibility.

Cooler Air . . . a cooling system of advanced design, perfected by the builder of LeRoi Engines, eliminates overheating.

Spring mounting . . . standard with LeRoi, reduces vibration and assures lower maintenance costs and increased life of the machine.

Engine and Compressor built entirely in the LeRoi plant . . . means centralized responsibility of manufacture.

USE THE Buckeye Surface Material SPREADER for Positive Accuracy

Places Material ✓ exactly where wanted, working to a definite line, any width up to the full width of the machine. No material scattered. No clean up gang needed.

Distributes It ✓ in exactly measured amounts, spreads evenly over each square yard of road. Accuracy is not affected by variations in speed of operation. Here, at last, is a machine that makes possible strict adherence to engineers' specifications.

SAVES TIME
SAVES MATERIAL

BID THE Buckeye WAY

THE BUCKEYE TRACTION DITCHER CO.
FINDLAY OHIO

Conn. Highway Rebuilt With Cold-Mix Top

(Continued from page 2)

the concrete crew which put through the entire job in less than one month.

The concrete was cured with cotton mats purchased from the Advance Concrete Road Curing Co., of New Haven, the mats being hand sprinkled for 72 hours and then removed.

Binder and Top Mixed in Providence

The contractor used his own permanent asphalt mixing plant in Providence, R.I., for preparing all of the binder and top courses for this project although this required a 34-mile haul. The bituminous concrete mix was made with dried stone and Socony 85 to 100 penetration asphalt in a Cummer plant and hauled in contractor-owned and hired trucks. The hired trucks hauled 2½-ton loads and the contractor's three Mack trucks hauled 9-ton loads.

The following table shows the quantities of material in each batch for binder or top; the mixing time was uniformly 3½ minutes.

Material	*Binder*	*Top*
Stone	2,695 pounds	2,653 pounds
Naphtha	3 gallons	3½ gallons
Asphalt	120 pounds	150 pounds
Lime	22 pounds	15 pounds
Sand	150 pounds	150 pounds

Spreading the Binder and Top

The trucks with their loads of the cold-mix backed up to an Adnun spreader and dumped a single hopperful of the mix into the machine and then pulled away. The spreader with traction on its four rear roller wheels and also on the two front steering wheels slowly moved ahead, laying down the 1½-inch binder course made with ½ to ¾-inch stone, or the ½-inch top made up with ½-inch stone down to chips. The 30-foot surface was spread in three 10-foot strips by the machine and rolled with a Buffalo-Springfield 12-ton tandem roller. A maximum of 24 hours was allowed between the spreading of binder and top. The asphalt crew consisted of the spreader operator, one laborer spreading the material in the machine hopper, three rakers, one tamper along the edge and the roller operator.

Personnel

The Project NRM 36F, which was awarded to M. A. Gammino Construction Co., Providence, R.I., on its bid of $51,275.98, was pushed through to completion on October 1, 1935, with Albert Libutti as Superintendent. For the State Highway Commission, R. A. Bennett was Chief Inspector.

Concrete for Aqueduct Carefully Tested

Exhaustive tests are being made of the quality of concrete going into the greatest concreting job in construction history, the Metropolitan Water District aqueduct project, which will bring water from the Colorado River to the thirteen Southern California cities which make up the Water District.

The latest of these tests was made recently when a specially built diamond drilling machine was placed in operation to secure samples of the tunnel lining. With black diamonds for a cutting edge, the new machine slices through the solid concrete lining of the finished aqueduct tunnels, lifting out cylindrical samples of the lining. These are shipped to the Water District testing laboratory at Banning, where they are subjected to exhaustive tests to determine if they fully meet the specifications.

A complete testing laboratory has been set up at the field headquarters at Banning. Cement is tested before it leaves the mills in sealed cars and then inspections and tests are made in each step in its mixing, placement and curing. The test of the cylinders of the tunnel lining completes the cycle.

Approximately 7,000,000 barrels of cement, enough to build a 14-foot concrete highway from Los Angeles to New York City, have gone into the construction of this 390-mile long aqueduct which ultimately will bring a billion gallons of water a day to thirteen Southern California cities, according to a story in the *Los Angeles Examiner*.

Seepage at Grand Coulee To Be Checked by Grout

(Continued from page 1)

refusal of the pump.

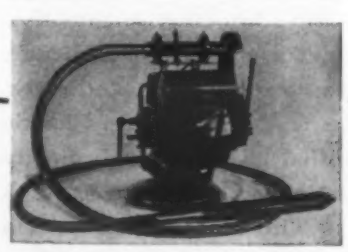
A 3-foot to 5-foot nipple, slightly belled at the inner end and threaded at the outer end, is inserted in the hole as a connection for the pump line. For a distance of about 6 inches at the belled end, oakum is packed between the nipple and the sides of the hole. The remainder of the space above the oakum is then filled with grout consisting of an aluminite admixture with portland cement, in the proportions of 1 to 2, respectively.

The compressor is a Worthington, 10 by 4½ by 10. In later operations, under higher pressures, this will be cut to 10 by 3 by 10.

In the grout plant there is an agitating device, also of M-W-A-K design, of the same barrel form, with a three-paddle air-motor-driven agitator. The grout used consists of neat cement and water in the proportions of 0.5 to 7.0, respectively.

K. L. Parker is Grout Superintendent and Ronald Jones, Grout Foreman.

Operators Grouting Just Outside the Tunnel Mouth



Concrete VIBRATORS
AND GRINDERS
Write for Circular on types, sizes and prices
White Mfg. Co.
ELKHART INDIANA

The RECORD and the MACHINE

Unit: 3/4 yd. L-40, owned by J. B. Towles, Lexington, Ky.
Job: 20,000 yds. of gravel pit borrow.
Height of Bank: Average 6 ft.
Degrees of Swing: 90° to 180°.
Hours Worked per Day: 10 hrs.
Average Yardage per Day: 870 yds.
Maximum Yardage per Day: 1469 yds.
Disposal of Material: All loaded to 2 and 3 ton trucks requiring about 11 ft. dumping clearance under dipper.

Discount, if you wish, the record of 1469 yds. in 10 hrs., as unusual—but the fact remains that in 23 days this unit moved 20,000 yds.—averaging 87 yds. per hr. dug and loaded to trucks. . . . The L-40 offers you 3/4 yd. output and profits at practically 1/2 yd. weight and costs—for the L-40 is built on the principle that Capacities depend on Stability and Strength, not Weight. . . . It handles an honest 3/4 yd. dipper at generous ranges; weighs 33,000 lbs.—yet it has the speed, power and endurance to turn out records like this and others detailed in the "Performance is Convincing" booklet. L-40 owners wrote it for you . . . Write for it.

THE UNIVERSAL CRANE CO. • LORAIN, OHIO

OTHER LORAINS

LORAIN-95 Big Dragline • 1½ yard Diesel LORAIN-77 • Truck Shovels & Cranes • 2 yard LORAIN-87

LORAINS—2 yd. to 3/8 yd.—Move More Material, Faster, at Less Cost

Quabbin Dike Built By Hog-Box Method

(Continued from page 1)

one gas-operated Lima shovel of the same size, each shovel being equipped with Amsco manganese steel buckets.

A Caterpillar Sixty bulldozer was used for maintaining the entrance road to the pit and for moving boulders out of the way of shovels and for general clean-up work around the borrow pit. In some parts of the pit, the material was very compact and filled with boulders. This material, although hard to dig, was found by analysis at the Commission laboratory to be of excellent quality for the purpose of the dike, and in order to use it, the contractor resorted to blasting, using an I-R wagon drill installed for the purpose.

Hauling Equipment

The contractor's hauling equipment moved 50,000 cubic yards a week, working three 8-hour shifts. It consisted of thirteen 6-yard Euclid Trac-Truks with the sides built up to permit 8-yard loads. Ten of these hauling units were of the trailer type and three of the 4-wheel type with dual pneumatics on the rear.

The shovels were spotted in the borrow pit in such a way that each hauling unit as it approached the pit could go immediately to the next shovel which required a hauling unit to keep it busy. Careful traffic management by the pit foreman was largely responsible for increasing the amount of material moved per day to about 8,000 cubic yards.

The Hog Box

The hauling units had an average run of about a quarter of a mile to the trestle over the hog box where the bottom-dump doors were released and the loads quickly delivered to the hopper. This hopper was built with a capacity of about 20 cubic yards. The trucks ran over a grizzly of railway rails spaced about 2 feet on centers which permitted the removal of the largest rocks before they reached the rotary grizzly.

The material from the hopper was fed by two reciprocating feeders to the Telsmith rotary grizzly which removed all rocks 8 inches or larger in diameter. The original set-up permitted these rocks to slide down a chute at the end of which was a swinging gate which held them back when the single cable car was dumping its loads. When operations got well under way it was found that an increased capacity for oversize rock was necessary and the track layout at the hog box was changed so as to include a siding and cars were alternated and hauled out by a Whitcomb dinkey engine.

The hog box is about 100 feet long by 20 feet wide and in the lower reaches normally carries from 2½ to 3 feet of water with the overflow at 6 feet. Material passing the rotary grizzly dropped into a 5-foot concrete sluice at the center of the hog box at a rate so that the material in the sluicing pipe to the dredge pump contained about 12 per cent solids.

Pumping

Water used for sluicing collected in the core pool in the center of the dike and was returned to the hog box through a 24-inch Naylor spiral steel pipe with Dresser couplings by three Cameron centrifugal pumps on a barge floating in the pool. These pumps were all single-stage electric-motor-driven at 2,200 volts; one 8,000-gpm 1,150-rpm 300-hp and two 2,000-gpm 1,800-rpm 75-hp. Water lost by seepage was made up by a 2,000-gpm 1,150-rpm Cameron centrifugal pump with a 60-hp motor located at Morton Pond nearby. The two overflow pipes from the hog box were 14-inch wood stave lines.

C. & E. M. Photo

The Hog-Box

Placement of the material in the dike was started with gravity flow for the close ranges through a 20-inch welded steel pipe line. The dredge pump was used on the farther ranges from the beginning of operations and gravity sluicing entirely abandoned after a very short time. The 20-inch American Manganese Steel Co. dredge pump, weighing some 30 tons without its 1,000-hp G-E variable speed motor, was used for both beach lines alternately. The pump measures 8 feet 6 inches high and 19 feet 6 inches in length.

Control of the barge pumps as well as signals for all changes in operation were by means of a siren mounted on the main control house above the dredge pump. On the floating pump house in the pool there were three lights mounted on the roof, each of which was con-

(Continued on page 30)

FREE

16-PAGE GUIDE TO LOWER MAINTENANCE COSTS

Tells how to repair your worn equipment and save thousands of dollars each year.

Start Saving Now!

Also write for illustrated circular describing the new Lincoln "SA-200 Special." It gives you improved quality and speed in welding at unusually low cost.

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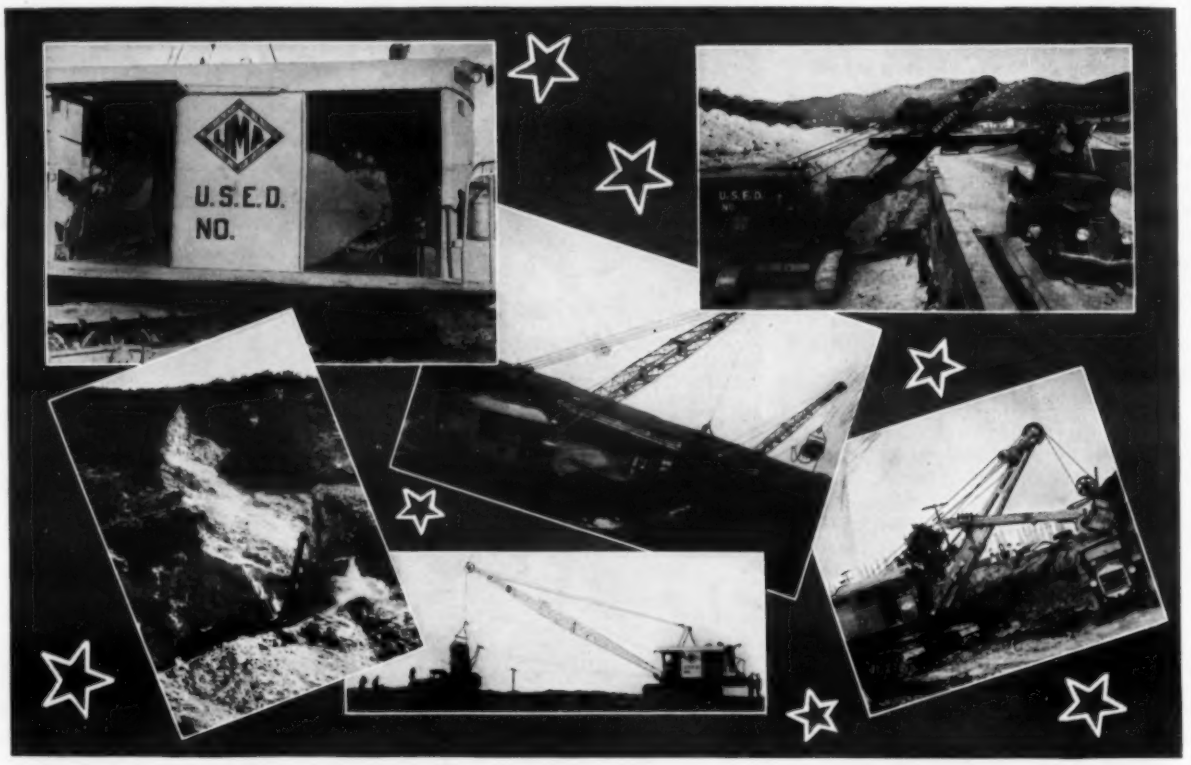

When Uncle Sam starts moving dirt he wants plenty of speed and power in the shovels and draglines he uses. In the Federal flood control operations in the Los Angeles area there are in government service Lima, P&H, Bay City, and American draglines and shovels, 2½ to 1 yard in size . . . eleven of them in all . . . and almost as many more being used by private contractors *—and every one of them is powered with a Waukesha-Hesselman Oil Engine.* Engine sizes range from the big 190 hp. six cylinder Hesselman to the 75 hp. four cylinder Hesselman.

To burn "modern high speed diesel fuels" you do not need to use hard-starting compression ignition engines. The Hesselman Engine is a low compression, solid injection engine that burns these fuels with high efficiency; yet weighs no more than, and starts as easily as, a gasoline engine. Electric spark ignition gives these advantages —easy starting, smooth-running, high economy. The Hesselman is also moderate in first cost. *Write* for Bulletin 1000. *Waukesha Motor Company, Waukesha, Wisconsin.*

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GIANTGRIP T
STRAIGHTEDGE
Either Steel or Aluminum

Formed straight under tremendous pressure on tubemill presses, it STAYS straight.

Two usable edges:—one sharp-cornered and squared for scraping; the other rounded for line-point straightedging. *Write for circular.*

L & M
Manufacturing Company
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Largest Exclusive Manufacturers of Paving Hand Tools
16362 BEREA ROAD, CLEVELAND, OHIO

Low-Cost Surfacing Beats Mud in Mass.

By E. E. JACKSON,
Junior Civil Engineer,
Massachusetts Dept. of Public Works

(Photos on page 40)

Sparsely Settled Town Resurfaces 27 Miles with Tar, Road Oil, Emulsion Under State Supervision

MANY people who now live in communities where hard-surfaced roads are taken as a matter of course forget that there is still a season of the year in the small towns of New England appropriately called "Mud Time." During this season, March and April, when the frost is coming out of the ground, many family cars are locked in the garage, and if a horse is not available the only method of travel is "Shank's Mare."

The Town of Boxford, Mass., which is located about 30 miles from Boston, is split in two parishes, East and West. The town hall is located in East Parish and in West Parish the Grange Hall is used for town affairs. The annual town meeting is held the first Monday in March, one year at the Town Hall in East Parish and the following year in West Parish. The distance between these two meeting places is 6 miles and as the town meeting is held just at the time when the frost is coming out of the ground, travel by auto has been impossible except by a long detour through two adjoining towns to get from one section to the other on this eventful Town Meeting Day. In 1931 a connecting link was made between the two parishes.

Boxford is a small town, with a population of 652 and valuation of $1,153,000, covering an area of approximately 30 square miles, and has 53 miles of roads. It is one of the unfortunate towns in Massachusetts without a state highway passing through. The only industry in town is farming, except for a small nursery.

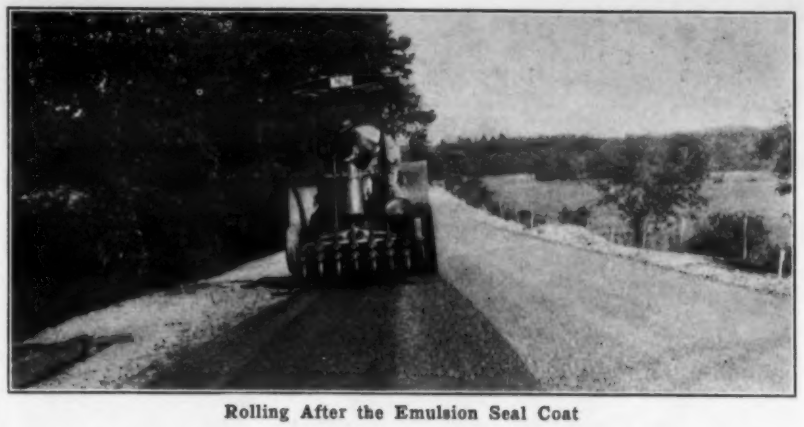
Twelve years ago the 53 miles of road were all mud roads during March and April, but today the town has 27 miles of black-top roads which are good the year round. This work has all been accomplished with an average allotment of less than $7,000 yearly by the town, plus approximately $19,000 given by the State and Essex County, the work being under state highway supervision, with practically all the work done with town forces. The above sums were used for maintenance as well as construction. The improvement of these roads has been of a low-cost nature, with the exception of 2 miles of bituminous macadam, built by contract at a cost of $94,500.

The Magic Carpet

The first step toward the construction of a more permanent road was made in 1923, when the town raised $2,200 which was matched with a like sum by both State and County. With this money a gravel road of 3,500 feet was built, construction consisting of the installation of drainage and gravel spread 15 feet wide, plus a gravel shoulder of 3 feet on both sides, the average depth of gravel surfacing being 9 inches after rolling. After the road was thoroughly rolled an application of one-third gallon of cold oil, 45 per cent asphalt, Mass. Spec. No. 3, was applied, giving the town its first black road. The work on this job was all done with double teams and gravel was loaded by hand, the only mechanical equipment being the steam roller.

Today most of the work is being done with mechanical equipment, such as gas shovels and power graders. The same general type of gravel construction was carried on until 1931, the only

(Continued on page 20)



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Lighter STRONGER

Special alloy steel enables a lighter yet stronger construction. The result—freer handling and a saving of crane power.

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THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio

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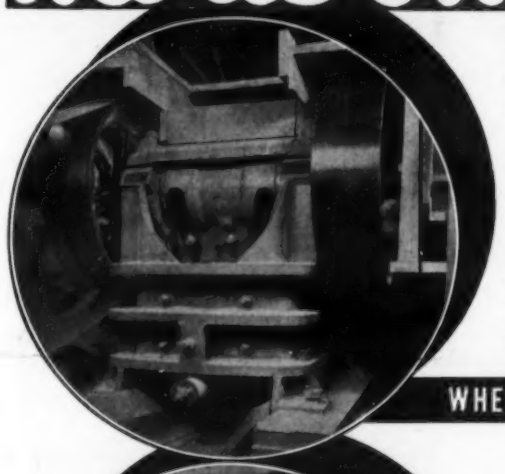
Modern IN EVERY SENSE OF THE WORD



To meet today's demands, Telsmith has built greater speed, larger capacity and lower upkeep into this three-piece combination of thoroughly modern equipment.

● **The Telsmith-Wheeling Jaw Crusher gives greater reduction in one process than any other type of breaker. Cylindrical roller bearings, force feed, and high speed almost double capacity. Both massive frame and swinging jaw are annealed cast steel; jaw dies are manganese steel. Simple adjustment allows wide sizing range. Upkeep is reduced to a minimum. Six sizes to meet every need.** ***Write for Bulletin W-34.***

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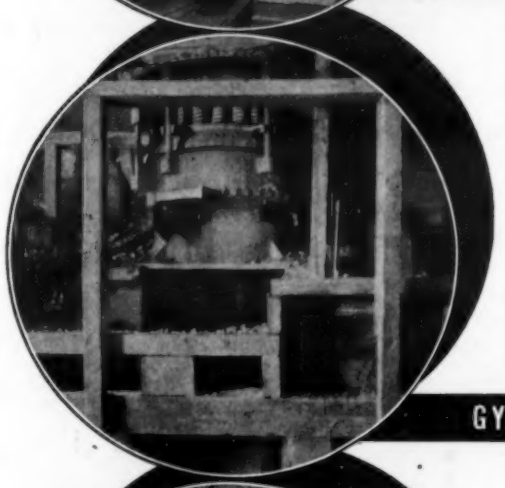

● **The Telsmith Gyrasphere gives you trouble-free secondary crushing...greater tonnage...a finer, more cubical product...more years of low up-keep service. Takes an unlimited choke feed. Only a Telsmith Gyrasphere Crusher has the** ***double-wedge crushing action,*** **the most effective crushing action developed in any crushing device...and** ***double protectors*** **(both labyrinth seals and piston rings) to reduce both oil consumption and maintenance expense to a minimum.** ***Write for Bulletin Y-34.***

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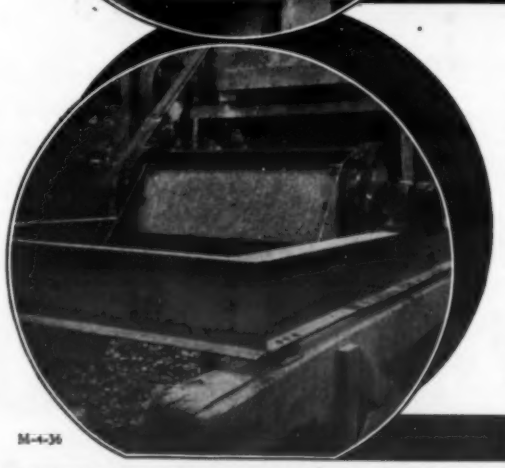

● **A better built, heavy-duty vibrating screen — the Telsmith Pulsator screens sand, gravel, crushed rock, ore, or coal...wet or dry. Its circular movement produces a maximum screening action...uniform on every inch of the wire...on every deck...under any load. Greater value, longer life and lower up-keep are built in — with the toughest alloy steels, the finest anti-friction bearings, and special labyrinth, piston ring seals for the protection of working parts.** ***Write for Bulletin V-34.***

M-4-36

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EVERY CONTRACTOR KNOWS

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It is a common error to confuse the words "price" and "value." Actually, "value" is what you get for the price you pay.

Ford believes "value," as applied to trucks and commercial cars, should be a combination of high quality at low price with superior performance at low cost . . . that it should include low operating cost, low-cost maintenance and long-lasting, brilliant performance. The experiences of truck and commercial car owners indicate that they agree with Ford's idea of value.

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• • •

Any new 112-inch wheelbase Ford V-8 Commercial Car can be purchased for $25 a month, with usual low down-payment. Any new 131½-inch or 157-inch wheelbase Ford V-8 Truck can be purchased with the usual low down-payment on the new UCC ½% per month Finance Plans.

FORD V-8 TRUCKS
AND COMMERCIAL CARS

Reduction of Accidents by Sodium Vapor Lights

(Photo on page 40)

The relationship of sodium lighting to highway safety after dark receives definite support in the report of the first year's experience on the Hamburg Turnpike installation at Pompton Lakes, New Jersey. Lighting on this mile and a half stretch is recognized as contributing to a 1,000 per cent reduction in night time accidents.

According to the report of the Chief of Police, there was only one accident between the hours of 5 P.M. and 6 A.M. since the installation of sodium vapor lighting, while during the previous year, eleven accidents occurred between the same hours. The only accident was a minor one in March, 1935, shortly after the installation, so that to date there is a night-time no-accident record for more than a year.

A three and four-lane highway of black macadam, this mile and a half stretch is very slippery in wet weather. Many dangerous curves were the scenes of serious and fatal accidents before the installation of the lights. These dangerous conditions, which would undoubtedly have continued to cause accidents after dark, are now readily seen under the sodium vapor lighting and drivers can take the necessary precautions.

This Hamburg Turnpike lighting system was designed and installed by the Westinghouse Lamp Co. and the Jersey Central Power & Light Co.

New Line of Welding Rods

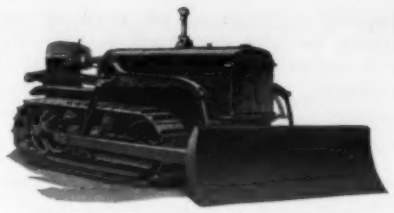
An entirely new line of coated rods for DC welding is now being made and sold by the Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis., manufacturer of P & H-Hansen arc welding equipment.

The present line includes five different types with both high and low rates of fluidity for various types of work in welding in flat, vertical or overhead positions and with ferrous and non-ferrous metals.

These Smootharc electrodes are designed primarily to speed up welding operations with a smoother, more easily handled arc and to reduce spatter losses. They are described in Bulletin No. R-1, copies of which may be secured by those interested direct from the company upon request.

A Bulldozer That Grades

Built with rugged construction, easily maneuvered and positive in action, the new Bullgrader made by Bucyrus-Erie Co., South Milwaukee, Wis., grades dirt as it is moved. The blade can be angled to the right or to the left to cast the dirt to either side, or set straight across for bulldozing. The lateral or tilting adjustment of the blade is simple



The New Bucyrus-Erie Bullgrader

with a special wedge lock. The bullgrader blade is powered four ways—up, down, for holding, and floating.

The weight of the unit is distributed uniformly on the track frame of the tractor. This, combined with the design of the Bullgrader, eliminates any tendency of the tractor to "bow down." The Bullgrader is mounted without cutting, drilling, or defacing the tractor frame and the tractor draw-bar is always clear for use. The blades may be secured in 9 or 10-foot lengths, 2 feet high. The blade can be tilted 34 inches above ground or 12 inches below ground.

Picks and Shovels

(Continued from page 1)

half pound or less of cement to be blown out of the barrel and scattered to the winds. The Scotch foreman, noticing the wanton waste of precious cement, called out:

"Hoot, mon, mind yoursel'. Dinna ye ken that that cement costs $6 a barrel?"

Without Comment

The chief statistician of *Roads and Road Construction*, London, England, reported in a recent issue that, as a result of profound calculations, he is able to state that at the current rate of progress all weak bridges and level crossings in Great Britain will be eliminated in 30 years, all bends and curves will be adequately super-elevated in 50 years, and pedestrians will be provided with properly paved footways in 110 years.

He adds that according to actuarial calculations his personal interest in weak bridges, footways and super-elevations is expected to terminate in 27 years.

From the time of Julius Caesar until 1910, it was more dangerous to go to war than to ride along the highway. Since then, however, there has been an ever-mounting motor toll until we have the answer to "What is worse than War?"

—J. D. Adams, Chairman, State Highway Commission of Indiana

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Exclusive Patented Money-Saving Features
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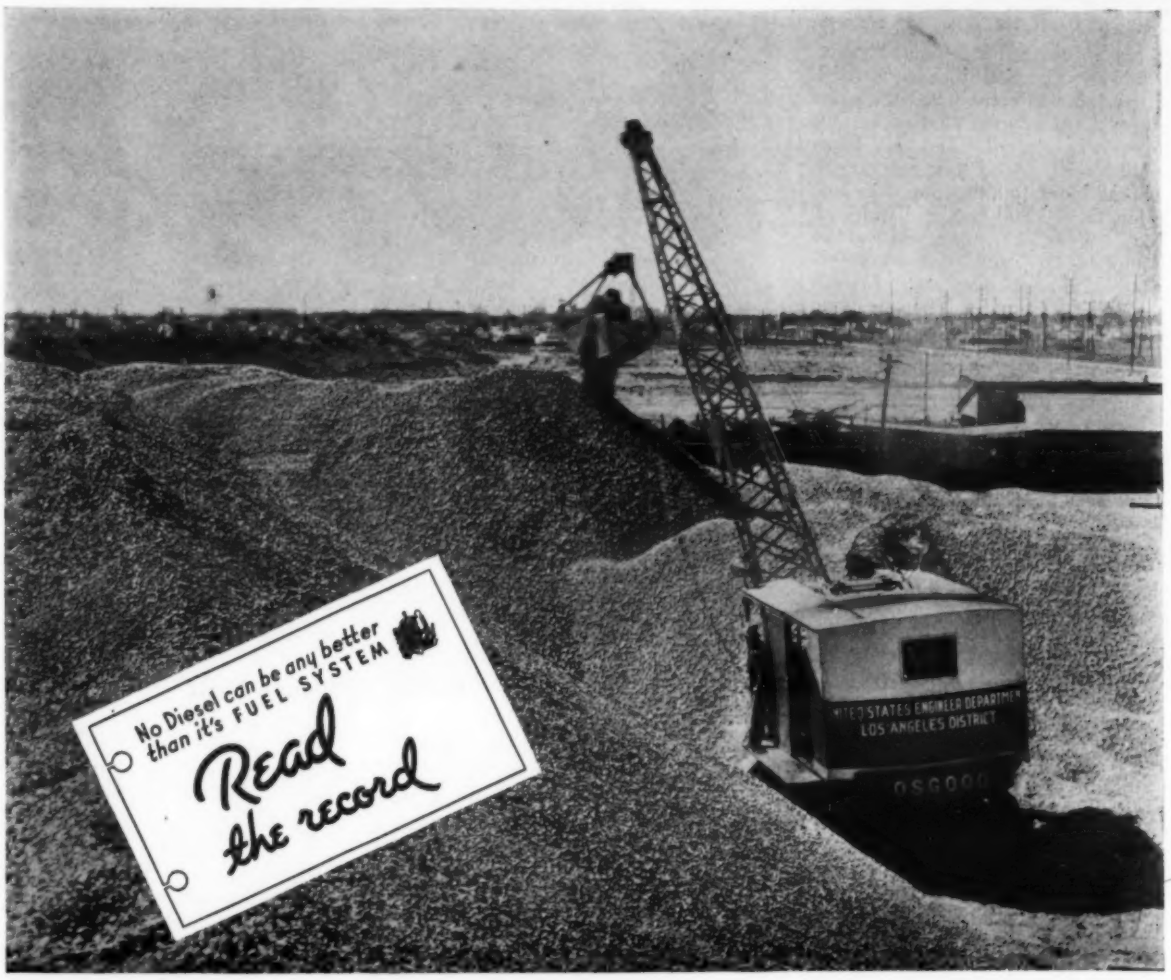
Hayward makes all four — clam shell, drag-line, electric motor, orange peel. A Hayward recommendation is unprejudiced.

—HAYCO—

THE HAYWARD CO., 32-36 Dey St., New York
HAYWARD BUCKETS


No Diesel can be any better than it's FUEL SYSTEM
Read the record
UNITED STATES ENGINEER DEPARTMENT
LOS ANGELES DISTRICT
OSGOOD

One of three new Cummins diesel-powered Osgood cranes just delivered to the United States Engineers for use on the Upper Ballona Creek job of their seventeen million flood control program in Los Angeles County.

Acceleration *without Vibration*
Lighter *in Weight*
Flexibility *and Cold Starting*
Backed *by Good Service*

CUMMINS ENGINE COMPANY, 606 WILSON STREET, COLUMBUS, INDIANA

CUMMINS-DIESELS

INDUSTRIAL • AUTOMOTIVE • MARINE

Mass. Town Builds Low-Cost Roads

(Continued from page 17)

difference being the increasing in width and changing surface treatment to one application of two-fifths gallon of cold tar, Mass. Spec. No. 14, covered lightly with sand and opened to traffic for two weeks to a month, after which another application of tar was made, using one-fourth gallon of retread tar, Mass. Spec. No. 14A, with a generous covering of coarse sand and honing. It was then covered with a dusting of sand, and finally smoothed up by dragging with an 8 x 14-foot piece of heavy wire fencing, similar to highway guard, at about 15 miles per hour. This fencing is locally known as the "Magic Carpet."

Mixed-in-Place Construction

The second step in the development of a more permanent surface was the mixed-in-place method. In 1931 the town was fortunate in being able to buy 1¼-inch gravel at a price of 50 cents per cubic yard at a nearby plant, and two experimental jobs were tried. The first job was constructed the same as a gravel road except that no surface treatment was applied. The gravel was thoroughly rolled, and then gravelstone was spread loose, to a depth of 3 inches, for a length of 1,200 feet, and width of 18 feet. When the stone was spread satisfactorily an application of three-fourths gallon per square yard of emulsified asphalt was made. The stone was then mixed by use of a road machine, windrowed and then respread, after which another like amount of emulsion was used and windrowed again. This time the stone was spread as uniform as possible with a road machine, then rolled firmly with a steam roller, after which one-third-gallon of penetration grade of emulsified asphalt was applied and covered with pea stone gravel. The cost of this surface was 32 cents per square yard, or a total of $3,000.

The second section was constructed in the same manner except that tar was used, and applications were first 0.35-gallon per square yard of retread tar, 70 viscosity, second 0.4-gallon per square yard and a seal of 0.25-gallon per square yard of the same material. This surface cost 25 cents per square yard, building 1,300 feet for $3,000. The cost was lowered due to the fact that less bitumen was used and the gravel pit was three miles nearer the job than the other section.

In 1933 another section of mixed-in-place road, 20 feet wide, was built, using 1¼-inch trap rock. The base was constructed with 12 inches of gravel, treated with one-third-gallon per square yard of cold tar, Mass. Spec. No. 14, covered with sand and opened to traffic for about two weeks after which surface construction was started. Two-inch stone was spread to a uniform grade averaging 3½ inches in depth and treated with three-fourths gallon per square yard of mixing grade emulsified asphalt. While asphalt was being applied, three Acme harrows were connected in tandem in back of the distributor which started the mixing of the aggregate, after which a smaller truck hauled the harrow. This was to our knowledge the first use of the Acme harrow for mixing stone. The stone was harrowed three times, becoming thoroughly black. This harrowing disturbed the shape of the road but little, although a road machine was used for general shaping. By this time stone was spread to about 20 feet. The next step was rolling once to set the stone and chinking with ½-inch pea stone, sweeping off the surplus and rolling firmly. This was followed with an application of three-fourths gallon per square yard of penetration grade emulsion, which was covered with a light spreading of ½-inch pea stone, sweeping off, and filling all voids and rolling again. The final treatment was a seal coat of one-third gallon per square yard of penetration grade emulsion, covered with pea stone and rolling, after which road was opened to traffic.

The same general method of construction was used in 1935, except that tar was used in place of emulsion. The first application was 0.4 gallon per square yard of retread tar, 70 viscosity, Mass. Spec. No. 14A, as a mixing grade, followed by 0.6 gallon per square yard of Tar A, Mass. Spec. No. 15, as a penetration and a final seal of 0.25 gallon per square yard of the same material. This type of construction is meeting the popular approval of the town as its riding qualities are excellent, with its non-skid surface, and low cost of construction.

Maintenance Converts Mud Roads

General maintenance has changed a number of mud roads to improved roads of a year-round nature. The following description of one road is typical. In the spring of 1923 the road was impassable by auto. As early as possible the road was scraped with a road machine, which put it back into shape, and then maintained until warm weather by use of a split log drag. When weather was favorable an application of one-third-gallon per square yard of 45 per cent road oil was made and covered lightly with sand.

The following spring this same road broke in a few places and in some cases gravel was spread in sections, but generally only surface ruts developed. The road was scraped again, and maintained until warm weather, when one-third gallon of 45 per cent road oil was applied and covered with sand. Although this took the road out of the mud class, it was necessary to treat it each year, so something of a heavier nature was needed. In 1927 cold tar was tried. This material eliminated the surface ruts, but hair cracks made it advisable to treat it again the next year.

The yearly application of surface treatments, with its uneven spreading

(Continued on page 36)

Water power ... *out of control* ... can be one of the most destructive forces known to man. Homes, property, human life—all are swept away with fiendish abandon. But *under control* ... water power brings the cheery comfort of heat and light to millions. CONTROL MAKES THE DIFFERENCE.

(*Right*) Control makes a difference in tractors, too. Note the absolute freedom of slippage, as shown by tracks in the sand—the result of BALANCE. This Model "K-O" and bulldozer keep fine, shifting sand from blowing back into California's All-American Canal.

Controlled Ignition
ELIMINATES THESE COSTLY PROFIT ROBBERS:

- **High Tension Rings**
- **Special High Pressure Bearings**
- **Heat Reservoirs In Combustion Chamber**
- **Special Lubricating Oil**

New 3-5, 4-6-Ton Trucks

A complete new line of 3 to 5 and 4 to 6-ton heavy-duty motor trucks has been announced by the Reo Motor Car Co., Lansing, Mich.

Six models are offered in the 3 to 5-ton class, with wheelbases ranging from 153 to 185 inches. Gross capacity ratings range from 18,000 to 20,000 pounds, and from 30,000 to 35,000 in tractor-trailer operation or with semi or full trailer. Power is supplied by a 6-cylinder Gold Crown engine. The cylinder block is of chrome nickel alloy iron and has a 3⅝-inch bore and 5-inch stroke. There are seven main bearings with 2⅝-inch diameter, while the total bearing area is 88.12 square inches.

Lubrication operates under full pressure to all main, connecting rod and camshaft bearings through rifle-drilled oil passages. Brakes are of the four-wheel internal hydraulic type with vacuum booster operation. The hand brake is of the 14-inch ventilated disc type and operates on the propeller shaft.

The sturdy heavy-duty frame on all new 3 to 5-ton models is 8 9/16 inches deep with a 3-inch flange width and ¼-inch stock. Long wheelbase models have extended frames lengthened and reinforced with fish plates 12 inches deep and ¼-inch thick.

Three models are offered in the 4 to 6-ton class. These have wheelbases ranging from 156 to 190 inches and gross capacity ratings ranging from 22,000 to 40,000 pounds. The power plant is of the heavy-duty six-cylinder type, with a 4⅜-inch bore and 4¾-inch stroke. A five-speed overdrive type transmission provides a great range of power and speed. In fourth gear, the unit has great pulling ability. The rear axle is heavy-duty full-floating double-reduction type.

Both the full pressure lubrication and vacuum power operating brakes are the same type as in the 3 to 5-ton models. The rugged frame, however, is larger, having a depth of 10 inches.

As an added feature, a guaranteed Truck Performance Rating is provided which tells exactly what performance may be expected from each model and enables the user to be sure that his truck is suited to his individual needs.

Controlled Ignition PERMITS PROPER BALANCE BETWEEN POWER AND WEIGHT

ALLIS-CHALMERS Oil Tractors are "trained down" to fighting weight. Light-footed . . . responsive . . . quick-acting—a pleasure to operate, a revelation in performance. The exclusive *Controlled Ignition* principle does away with the extra dead weight which cuts down speed, wastes power, and slows up production. Such familiar penalties of high compression ignition as heavy, unbalanced parts, special heavy construction and auxiliary starting devices are no longer necessary. Once again Allis-Chalmers leads the way—this time to give you maximum economy on Diesel fuel oil, combined with simplicity, smoothness, better balance, greater flexibility, easier servicing, instant starting, lower first cost. Branch house and dealer service everywhere. Ask the A-C dealer.

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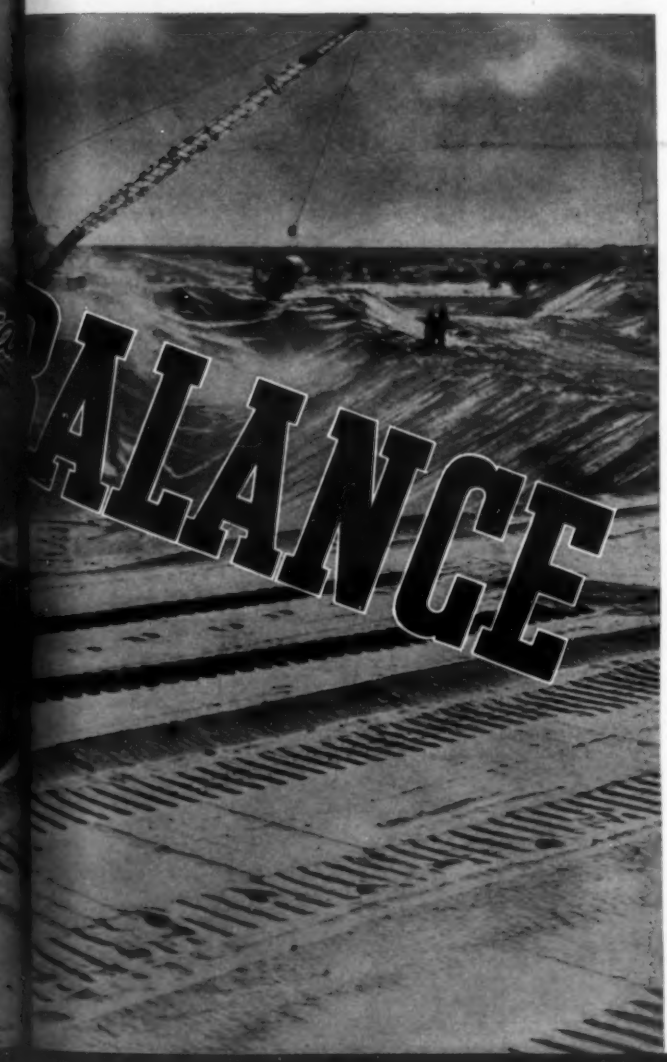

CONTROLLED IGNITION OIL ENGINES—INCLUDING FUEL PUMPS AND INJECTORS—ARE OF ALLIS-CHALMERS OWN DESIGN

CONTROLLED *Instant* STARTING
Easy starting, regardless of weather. Crank or self-starter. No auxiliary starting motor.

CONTROLLED INJECTION OF FUEL
Diesel fuel oil is sprayed (not squirted) into the combustion chamber at 60° before top dead center. Fuel pump of A-C design . . . measures charge of fuel accurately, regardless of load or throttle setting. Simplest, easiest to service fuel pump built. Controlled pressure in fuel lines — no hammer-like blows from pressure changes.

CONTROLLED AIR-FUEL RATIO
Specially designed injection system maintains proper ratio for efficient combustion at ALL engine speeds. No excess of air at idle speeds to lower exhaust temperatures at the expense of power.

CONTROLLED IGNITION
Controlled spark ignition at exactly the proper point for complete, efficient combustion. No chance of power-wasting pre-ignition. High compression pressures with the resulting destructive forces are eliminated. No need of special rings, or heavy, unbalanced parts. No split-hair tolerances.

Again ALLIS-CHALMERS LEADS THE WAY

RS *ntrolled gnition* OIL TRACTORS

Hard Rock Tunnel for N.Y. Sewer

(Continued from page 11)

until finally No. 1 car is behind the mucker and filled.

When the train is full, it takes all of the muck from one round of blasting. This gives the minimum haul for the train and keeps the motor trucks away from the job except once in every 6 hours. As the cars are hauled back to the shaft, they are dumped one at a time into the skip which is hoisted up and dumped into the muck bin.

The limit switch at the top checks the skip travel so that the hoist must be started again to dump the skip completely. This prevents throwing rock over the top of the muck bin.

Auxiliary Equipment

Two Coppus blowers and two lines of Ventube are used to ventilate the tunnel. A No. 3 blower is used to blow the head clear and a No. 5 blower on the long Ventube line from the shaft or from the manholes as they are encountered.

The motor generator set mounted in the shaft is used to charge the batteries for the Mancha locomotives. This 5-kw set delivers 48 amperes at 100 volts. An overhead chain and falls picks the complete set of batteries off the locomotive below, hauls it up to the platform and lets down the spare set which has been charged.

As the tunnels make a 90-degree angle at the shaft, the contractor has taken advantage of the situation to run two sidings through the shaft with the main track in the center next the skip. The switch points of the sidings are located at the portals of the tunnels, giving the maximum lengths of sidings. These sidings are used for temporary storage of cars by running in the locomotives when the batteries are to be removed for recharging and for quick minor repairs.

In the rock section the manholes, which are located at spacings ranging from 200 to 700 feet, are sunk in advance of the tunnel so that they may be used for ventilating.

The Manhattan schist through which most of this tunnel is driven is interspersed with longitudinal vertical veins of serpentine or disintegrated schist which is very soft, requiring timbering. Where these serpentine intrusions occurred frequently, the rate of driving the tunnel was materially reduced. Veins 200 feet long of quartzite were struck immediately following the serpentine. Six pounds of du Pont 40 per cent dynamite per yard of quartzite was used on this material and 3 to 5 pounds for softer rock.

Personnel

The Manhattan intercepting sewer from 73rd Street to 164th Street, Manhattan, is PWA Project 8044, financed by a $25,000,000 loan and grant to the City of New York by the Public Works Administration. The project was started under the direction of the former Commissioner of the Department of Sanitation, Col. Thomas W. Hammond; with Walter D. Binger, Deputy Commissioner in charge of the Engineering Division of the Department; Richard H. Gould, Chief Engineer, Sewage Disposal and Intercepting Sewers; Herbert M. Hale, Engineer of Construction of the Wards Island Works; and Pincus Rizack, Resident Engineer. The contractor is the Rosoff Tunnel Corp., 1870 Second Avenue, New York City, for which Fred W. Stiefel is Chief Engineer, J. M. Ribble, Construction Engineer and R. L. Oates, Superintendent at Shaft No. 1.

The article on contractors' insurance, announced for publication last month, will appear in August.

Common Salt Used for Road Building

(Continued from page 8)

quantity to approximately 1,000 cubic yards per mile. This is done by measuring the windrows. This quantity, when stabilized, will produce a wearing course 3 inches deep and 20 feet wide.

"Soil binder is then delivered and windrowed on each shoulder in sufficient quantities to produce a stabilized mix of the desired plastic index; the quantity having previously been determined by test in the laboratory. As soon as the soil binder has become dry, it is spread, pulverized and bladed back into its original position on the shoulders.

"The gravel windrow from the center is then spread over the prepared subbase between the rows of soil binder and the pulverized soil binder is then spread uniformly over the gravel. The mass is then thoroughly mixed by blading and, after mixing, it is split into windrows on each shoulder of the road."

Traveling plants have recently been developed for use in placing soil stabilized roads which usually pick up the material from the windrows, run them through a continuous mixer and deposit them on the road. Water is sometimes added while the material is being mixed.

The trend at the present time seems to be toward the use of plant-mixed materials since the soil binder may be added to the aggregate as it is being produced. For best results the soil binder is pulverized and added to the aggregate production line in a continuous stream. After the material passes through the processing screens, the result is a finished mix. When pug mill mixers are used, it is possible to use the soil binder in a dampened condition. In this case the production of stabilized material is not so dependent upon weather conditions.

The sand-soil binder and coarse aggregate may be proportioned in a concrete batcher plant and mixed dry in a regulation concrete mixer, by which method it is possible to get good results in 30 seconds of mixing.

Placing Material

Stabilized material should be placed in layers thick enough for speed in placing but not too thick for good compaction. In the case of road-mixed material, the mixture is usually bladed over the dampened grade from a windrow on the shoulder. Unless there be sufficient moisture on the grade, the course should be wet, either with brine or water, until slightly above the plastic limit. Long base leveling devices or

Spreading Rock Salt on a Road Near Oak Hill, Ohio

maintainers should then be used in smoothing up the course before compaction. For best results, not more than 3 inches of loose material should be applied at any one time. Enough water should always be added to make the entire mix somewhat plastic. In case the water or brine has not penetrated the entire course, the material should be lightly disked or harrowed to avoid dry pockets. If more than 3 inches of this material is placed at one time,

(Continued on page 26)

A New Spray Nozzle

A simple non-clogging spray nozzle for spraying, washing and cleaning all types of material has been announced by the Link-Belt Co., 300 W. Pershing Road, Chicago, Ill. This nozzle is a scientifically-shaped smoothly-polished curved bronze deflector with a U-bolt for clamping it securely to the water pipe, in such a position that it is just above the orifice in the wall of the pipe.

The width of the deflector permits a comparatively large water jet and thus allows fairly large dirt particles to pass through the orifice without clogging it. These particles are deflected with the water, as the deflector has a smoothly polished contact surface with no projections to permit wedging or clogging.

This spray nozzle is made in two standard sizes for assembly on 1½ and 2½-inch diameter pipe. The diameter of the orifice can be made the proper size to suit the pressure and the volume of water per deflector. To assemble the deflector on the pipe, it is only necessary to place it in proper position over the orifice and then tighten the hex nuts on the U-bolt.

A new 4-page illustrated Folder No. 1407 describes the nozzle in detail and gives capacities in gallons of water per minute for the different diameters of orifices at various water pressures. Copies may be secured direct from the Link-Belt Co.

STERLING HOISTS
Timken Bearing Equipped
Johns-Manville Asbestos Frictions
High Carbon Ground Precision Shafts
Improved Screw Thrust with Positive Clutch Release

Write for complete catalog.
STERLING MACHINERY CORP.
411 Southwest Blvd., Kansas City, Mo.

Three Le Tourneau 12-Yard Carryalls on the Tri-City airport.

ON THE NATION'S AIRPORTS . . .

. . . from coast to coast Le Tourneau units are hastening safer flying by moving the earth to make larger landing fields and longer, smoother runways. Typical performance is the work now being done by three Le Tourneau 12-Yard Carryalls, one 8-Yard Carryall, a Rooter and an Angledozer on the Tri-City airport in Sullivan County, Tennessee. There, in heavy red clay with some limestone outcroppings, the Rooter and an RD8 tractor ripped up the earth to speed Carryall loading. The four Carryalls on an 1,800-foot round trip haul placed 5,000 cubic yards of this ripped material in a timed 14-hour period, left behind a smooth field for one of Tri-City's long runways. Such yardages as this are common wherever Le Tourneau equipment works, whether it be on airports, highways or dams. Such yardages mean more construction from tax money, more profits for earthmoving contractors.

Ask your "Caterpillar" dealer to show you what Le Tourneau job-proved equipment is doing on construction projects near you.

R. G. LE TOURNEAU, INC.
Peoria, Illinois Stockton, California
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Manufacturers of: Angledozers, Buggies, Bulldozers, Carryall Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters, Semi-Trailers.

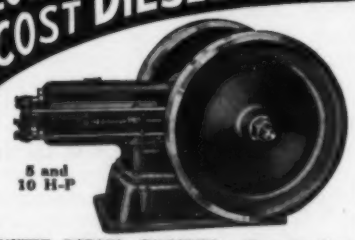
LE TOURNEAU

Nashville

Tupelo

Knoxville

LOWER COST DIESEL POWER



5 and 10 H-P

WITTE DIESEL ENGINES—offer startling economy, cut operating costs and increase profits. Simple construction—few moving parts—low fuel consumption.

3 to 7½ KW A.C. or D.C.

DIESEL LIGHT PLANTS—produce light and power for less than one cent per Kilowatt. Write for details—no obligation.

Distributors Wanted With Diesel and Electrical Experience

Witte Engine Works
187B Oakland Ave., Kansas City, Mo.

Steel Beam Bridge in Eastern Kansas

(Photo on page 40)

Continuous Beam Structure, Typical Kansas Bridge, Built Near Lyndon on U. S. Routes

THE Marais des Cygnes River Bridge south of Lyndon, Kansas, on U. S. Highways 75 and 50S is typical of the continuous steel beam bridges which the State Highway Commission of Kansas has found to show excellent economy in construction and materials. A number of these continuous deck girder bridges have been built, ranging from 3-span groups to 5-span and even 7-span groups, involving continuous lengths as great as 450 feet without intermediate floor expansion devices. The maximum span length used for continuous rolled beam designs is 105 feet, but spans as long as 117 feet have been used with comparatively shallow deck construction, using built-up continuous steel girders haunched over the piers. The Commission has also built one reinforced concrete structure involving a central span of 110 feet in a 5-span continuous group.

The Marais des Cygnes River Bridge has two center spans of 80 feet each and two end spans of 66 feet 4½ inches each. Excavation for the three piers was carried to shale through loam and gravel. Each of the two footings for each pier measures 8 feet 6 inches by 6 feet 6 inches and 2 feet 6 inches in depth with a grid of ⅝-inch round bars on 6-inch centers both ways, 3 inches from the bottom of the footing. The pier columns are approximately 4 feet 9 inches in diameter at the base and are battered ⅜-inch per foot to the cap which is 3 feet 3 inches wide for all three piers. The pier columns are reinforced with eight 1-inch round vertical bars and ⅜-inch round hoops spaced 18 inches on center.

An arched concrete web-wall spans the upper 12 feet of each pair of columns and has a 9-foot 4½-inch radius intrados with a 6-inch rise. The pier columns are 22 feet center to center with a cap of 25 feet 4 inches overall length, reinforced top and bottom with four ¾-inch round bars uniformly spaced and running throughout the length of the cap. A bar mat is provided under each main beam bearing by means of ½-inch square bars at right angles to the ¾-inch round bars, three such bars being provided under each of the exterior beams, five under the center beam, and four under each of the two intermediate beams.

Abutments

The abutments are of the pedestal type with two buttresses and two independent footings each. Each of the south abutment footings is carried on twelve piles driven to rock and measures 15 feet x 6 feet. The reinforcing at the cut-off line of the piles, 12 inches from the bottom of the 36-inch footing, consists of a grill of ½-inch square bars on 6-inch centers both ways.

The south abutment is 27 feet high from the cut-off of the piles to the bridge seat. The buttresses are 2 feet 6 inches thick and 10 feet 7½ inches wide at the base and 15 inches wide at the bridge seat. They are reinforced with 1-inch round vertical bars and are doweled to the footing with ¾-inch

Quantities

Location	Excavation Dry	Excavation Wet	Excavation Rock	Concrete Class A	Concrete Class D	Steel Struct.	Steel Reinf.	Steel Cast	Cast Iron	Plain Timber Piling
Abut. 1	220	14	9	62.2			5,250		768	288
Pier 1	60	72	9	51.1			4,010			
Pier 2	23	73	8	51.1			4,010			
Pier 3	23	83	7	52.3			4,060			
Abut. 2	195	24	20	62.1			5,490			
Superstr.				207.9	14.2	248,580	37,330	3,910	616	
TOTALS	521	266	44	486.7	14.2	248,580	60,130	3,910	1,384	*288

* 24 @ 12 feet

(Continued on page 32)

TENTS
TARPAULINS
WINDBREAKS
The Fulton line is sold through Contractor Supply Dealers in every state. A quality line priced right. Ask for SHUREDRY and FULTEX Tarpaulins, Tents, Windbreaks.
Write our nearest plant today for catalog, samples and price list.
Fulton Bag & Cotton Mills
Manufacturers Since 1870
ATLANTA ST. LOUIS DALLAS

The Cleveland DR-6
leads them all
In Adaptability to all sorts of drilling positions and conditions. Any angle —any direction. Wheels swivel.
In Convenience of Operation. Easily and quickly changed from one position to another. Throttle and blowing controls conveniently located, and always in the same place. Continuous air feed — easy to change steels.
In Drilling Speed. 800 to 1000 feet of holes per day per machine commonly reported.
In Blowing Power. Blows with that sudden "Blast" that cleans out all the dirt.
In Portability. Readily towed behind a light truck or automobile. Standard road gage, but can be set to 16" narrower for close places.
In Economy. Requires less air. Repairs less than any other make of drilling rig.
In Originality. First to use pneumatic tires. First to use the frame as an air receiver. First to use long air feed. First to be able to drill at any angle.
Bulletin 111 tells the story. If you have rock to remove, write us your problem. We can help.
THE CLEVELAND ROCK DRILL COMPANY
3736 East 78th Street • Cleveland, Ohio, U. S. A.
Cable Address "ROCKDRILL"
Spare Parts Stocks Maintained in the Principal Cities and Mining Centers.
LEADERS IN DRILLING EQUIPMENT

BURCH
Balanced POWER for RAISING or LOWERING
DUMP BODY HOIST
ONLY ONE MOVING PART
Balanced power for raising or lowering—automatic locking, any position—one moving part—no gears—no oil lines—no heating or foaming of oil. Plain and Braced Side Bodies—1½ and 2 Yard capacities.
FAST! POWERFUL!
Write for Literature
THE BURCH CORP.
Dept. A- CRESTLINE, OHIO

New Novo Dealers Appointed

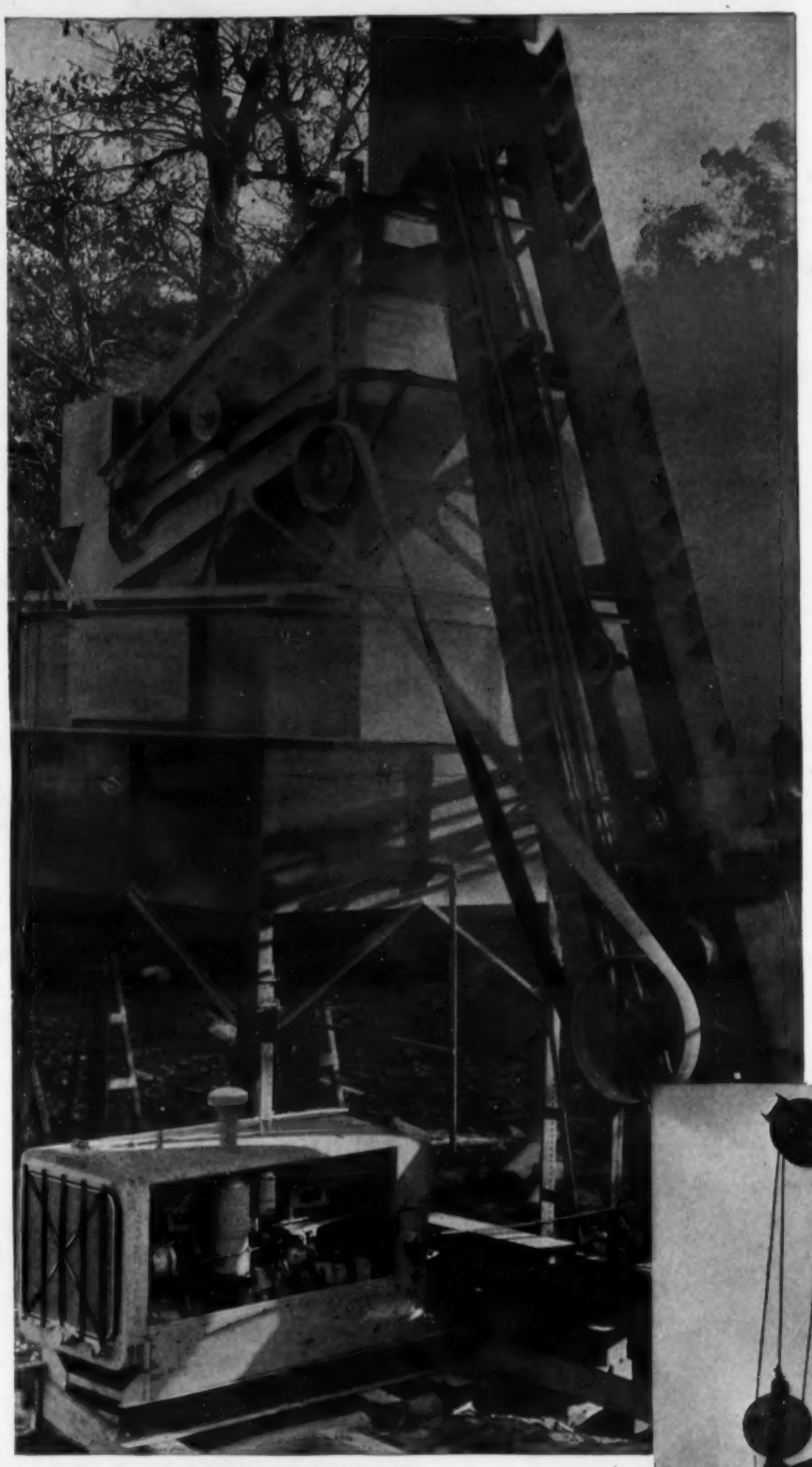
The following equipment distributors have been appointed to handle the line of Novo equipment by the Novo Engine Co., Lansing, Mich.: Borchert-Ingersoll Co., St. Paul and Duluth, Minn.; Funkhouser Equipment Co., Kansas City, Mo.; Garlinghouse Bros., Los Angeles, Calif.; General Machinery Co., Spokane, Wash.; W. N. Herod & Co., Miami, Fla.; J. B. Hunt & Sons, Raleigh, N. C.; Lincoln Iron Works, Rutland, Vt.; Perrin, Seamans & Co., Inc., Boston, Mass.; Smith Tractor & Equipment Corp., Irvington, N. J.; Virginia Tractor Co., Inc., Richmond, Va.; Waterloo Construction Co., Waterloo, Iowa.

Wortham Machinery Co., Cheyenne, Wyo.; The Sawtooth Co., Boise, Idaho; Warren D. Sampson Co., West Springfield, Mass.; John B. Foley, Jr., Syracuse, N. Y.; Dakota Equipment Co., Sioux Falls, S. D.; Cunningham Machinery Co., Shreveport, La.; Contractors Equipment & Supply Co., Albuquerque, N. M.; and Clarkson Hardware Co., Ocala, Fla.

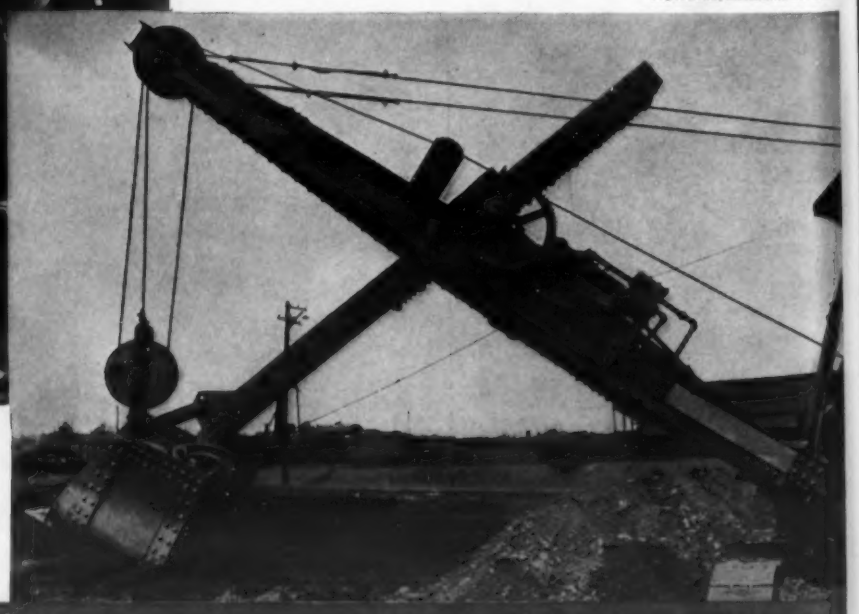
Germany Completes Road

A 16-mile section of the super-highway system of Germany between Leipzig and Halle Saale was completed last April. The construction is of concrete, a double roadway with a total of 78 feet of paved surface and with a 16-foot grass and shrubbery lane between the concrete roadways. Like the remainder of the German super-highways which are being constructed, there are no grade crossings.

None other than Benjamin Franklin laid out the Boston Post Road, on a wide right-of-way, which to this day is the main artery between New York and Boston.



Crushing stone is grit-swept work. Special lubricants are required for heavy duty service like this.



In shovels and draglines, besides several types of bearings, wire rope also requires special types of lubricant which affect service life and safety. Let Standard lubrication engineers help you keep such equipment operating at maximum efficiency, lowest cost.

MACHINE-WEAR
is part of the job-cost!

IT'S the hard-to-measure unexpected costs that too often take the hard-earned profits out of a job. Depreciation of equipment, costly repairs and delays—many a dollar is lost on the operation of outdoor machinery because lubrication fails to lubricate or fails to provide adequate protection on bearings against abrasive dirt.

If your machinery operates anywhere in the Middlewest, the best lubrication insurance you can buy is Standard Oil Service—and it costs no more. First, Standard Service offers a full range of automotive and industrial oils and greases of guaranteed quality and uniformity. Second, the Standard Oil engineer will assist your men on the job to get most effective results. Third, this Standard Oil Service is readily available to you in every locality of 13 Middlewestern states.

Ask the Standard Oil engineer about lowering fuel costs for Diesel and gasoline engines; ask also about Stanorust, an easily applied rust preventive.

Copr. 1936, Standard Oil Co.

STANDARD OIL COMPANY (INDIANA)

CORRECT LUBRICATION

Light-Gage Welding Rods

Thinweld, a specially-coated electrode for arc welding light-gage sheet metal, is now offered in 1/16, 3/32 and ⅛-inch sizes by the Hobart Brothers Co., Box CE-56, Troy, Ohio. These rods are particularly adapted for use with the new Hobart 75 and 100-ampere Simplified arc welding machines.

Among the applications of these new rods are auto body and fenders; fabrication of heaters, ducts and similar work.

Cyrus McCormick Dies

Cyrus H. McCormick, retired chairman of the board of directors of the International Harvester Co., died on June 2. Mr. McCormick was a principal factor in the formation of the company in 1902 and served as its president from that time until 1918 when he became Chairman of the Board, which office he held until his retirement last September.

Upon his graduation from college, Mr. McCormick entered the McCormick Harvesting Machine Co., of which his father was the head. In 1884 the son succeeded to the presidency of the McCormick Company, already the largest industry of its kind in the world. In 1902, the McCormick Company united with others to form the International Harvester Co., and Mr. McCormick was elected the new company's first president.

Marion Opens Texas Office

In order to facilitate the handling of increased business in the Southwest, The Marion Steam Shovel Co., of Marion, Ohio, is establishing an office in San Antonio, Texas, with Paul E. Piersol in charge. Temporarily Mr. Piersol's headquarters will be with the Motor Equipment Corp., 419 N. Flores Street, which has recently been made distributor for Marion excavators in southern Texas.

ON HIGHWAYS and BUSY BOULEVARDS

STANOLIND ASPHALT

is proving its many values . . .

FROM scenic mountain roads to busy city streets and parkways, you'll find Stanolind paving asphalts meeting widely varied traffic requirements with unexcelled records of satisfactory service.

Here are some of the reasons why contractors and public officials throughout the Middlewest prefer to buy from Standard Oil:

(1) All of Standard's refineries operate in this territory, hence prompt delivery can be assured, and at low shipping cost;
(2) Stanolind Asphalts can be readily supplied to meet every requirement;
(3) Dependable quality and uniformity simplify application and assure better results;
(4) Standard Oil (Ind.) has been a leader in the development of improved asphalt materials for easier handling and longer wearing asphalt pavements.

Call in the Standard Oil (Ind.) representative whenever you are figuring an asphalt job. His practical assistance often helps to complete a better job at lower cost.

Stanolind Asphalt paves many of America's busiest boulevards. The ease and speed with which it can be laid, the cushioned ruggedness with which it withstands traffic, and the ease with which it can be maintained, recommend Stanolind asphalt for busy city streets.

Stanolind Asphalt paves the highest highway in America—across the Continental Divide.

ASPHALT goes farther

STANDARD OIL COMPANY
910 S. MICHIGAN AVE. (Indiana) CHICAGO, ILL.

IN LONG-WEARING ROAD MILES . . . IN DISTRIBUTION OF LABOR . . . IN TAXPAYER SATISFACTION

Common Salt Used for Building Low-Cost Roads

(Continued from page 22)

there is difficulty in getting the moisture to penetrate uniformly. Compaction is also difficult as plastic material does not have stability. With more than 3 inches the road becomes spongy and rolling is of no benefit. Ordinarily, 3 inches of loose material will compact to about 2 inches. Each course should be allowed to season and set partially before the next one is placed. In order to secure a satisfactory bond between courses it is necessary to apply brine or water prior to the placing of additional dry material. Since plant-mixed material is delivered to the project already mixed, it can be placed upon the grade immediately. The mix may be placed by spreader boxes, by asphaltic pavers, or by dumping on the grade and blading into position.

When run-of-bank gravel, including the clay overburden is suitable for stabilization, mixing on the road may be eliminated. The usual practice is to set the shovel in the pit at the proper height to secure the correct gradation of soil binder and coarse aggregate. A few passes of the shovel through the material will thoroughly mix it. This pit-mixed material, when it satisfies the requirements for stability, is ready for placing on the prepared sub-base and from this point on is handled the same as road or plant-mixed material.

Incorporation of Salt

Rock or evaporated salt is usually incorporated in the upper 3 inches of a course but may be distributed throughout the entire thickness of the stabilized mat. It is sometimes placed between layers as the material is laid but it may be mixed with the aggregate and soil binder.

Several projects constructed during 1935 will be observed closely to see if the salt in the lower part of the course has any effect on the wearing qualities of the road. Some observations indicate that a 6-inch road, having salt in the lower 3 inches has a better surface condition than an adjacent section having salt in the top 3 inches only. A reservoir of moisture and salt from which the surface can draw as needed seems to be provided.

The amount of salt used varies somewhat in the different states. The most common amount seems to be about 2 pounds per square yard for a 3-inch thickness of stabilized road. Indiana requires ¾ pound per square yard per inch of thickness, regardless of the total thickness. The salt is applied in the form of brine throughout the entire depth. In some sections of the country brine is more available than solid salt and results indicate that either may be used.

Water or brine is usually added by means of pressure distributors, sprinkler wagons or gravity tank trucks. Several short trips over the course, sprinkling lightly on each trip, should be made. This gives the moisture a chance to penetrate the entire course and does not result in a sloppy condition on the surface.

Compacting

Various methods have been used in compacting the moistened stabilized course. Two and three-wheeled rollers, truck-drawn single rollers, multiple-wheeled pneumatic-tired rollers, and dual-wheeled trucks have been commonly used. Stabilized roads should be rolled by equipment which will provide both a compacting and a kneading action. Usually a combination of dual-wheeled trucks and ordinary power rollers provide this action.

After the course has been compacted, it needs usually a slight leveling or smoothing before it is a finished road. This can be done with long-base maintainers or graders during or immediately after a rain, or after the road has been sprinkled enough to form a thin plastic mulch on the surface. Any maintaining done when the surface is dry and hard will result in an unsatisfactory torn condition and loss of material.

Sales of Osgood Shovels and Cranes to U. S. E. D.

Since the first of December 1935 the Osgood Co., Marion, Ohio, has sold a total of twelve pieces of excavating equipment to the U. S. Engineer Department at Los Angeles, Calif., for use on its large flood control projects in and near that city. The deliveries include ten 1-yard cranes, five powered with Hercules engines and five with Cummins diesel engines, and two 2-yard shovels powered with Buda diesel engines.

The original order was for five cranes which were delivered in December, 1935, then three cranes delivered in February followed by the two shovels with Amsco buckets for rock work, and finally the last two cranes.

R. T. Muirhead has been the Osgood representative in the Los Angeles district since September, 1935, with headquarters for sales and service at 1726 E. Washington Street, Los Angeles. Service for Cummins diesel engines, of which there are over 300 in use in the vicinity of Los Angeles, is furnished by Diesel Motor Sales & Service Corp., 2331 East Olympic Blvd., Los Angeles, Calif., Joseph J. Gutman, President.

Booklet of Concrete Tables

A handy booklet containing tables and data based on the most recent developments in concrete work has recently been published by the Penn-Dixie Cement Corp., 60 E. 42nd St., New York City. Its purpose is to enable quick estimating of quantities needed for given jobs, to designate the proper types of concrete to use for various kinds of construction and to determine how to secure concrete meeting requirements of special specifications as to cement content, maximum water permissible, workability, etc.

Copies of this booklet may be secured by interested contractors and engineers direct from the Penn-Dixie Cement Corp. by mentioning this magazine.

HELTZEL STEEL FORMS

Bins and Batchers, Steel Forms for Roads, Streets, Sidewalks

Contractors call them HELTZEL UTILITY FORMS, because with one set of these forms they can construct the following types of concrete street work: *sidewalk, curb, combined curb-and-gutter* and *integral curb-and-base.*

Designed for use on any kind of subgrade and producing uniform concrete with dense smooth surfaces, HELTZEL UTILITY FORMS are *built to last,* yet are *easily handled* and *economically set and stripped.*

Illustrated at right—the standard HELTZEL ROAD FORM—self-aligning, extra strong, easy to handle. To the original HELTZEL design we have added practical refinements that result in *minimum handling costs, assured rigidity,* and *maximum strength and durability* . . . . enabling any contractor to do *better* work in *less* time and with *lower* costs. *They meet any highway specifications or requirements.*

Illustrated below—COMBINED CURB-AND-GUTTER FORM with double radius face form. Insert shows skeleton face-rail support. Each rail is securely locked in place, being keyed to the stakes. The division plates support front and back rails their full depth, and can be removed without disturbing concrete or side rails.

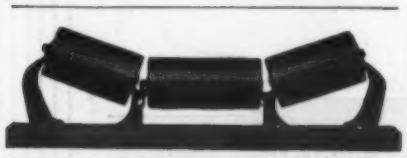
Write for Bulletins:

No. 101—"Heltzel Steel Forms for Modern Road Construction"

No. 200—"Heltzel Steel Forms for Building Curb, Gutter and Sidewalk"

Heltzel Steel Forms were used exclusively for building the roadway over New York's Sixty Million Dollar Tri-Borough Bridge

THE HELTZEL STEEL FORM & IROX CO.
Warren, Ohio

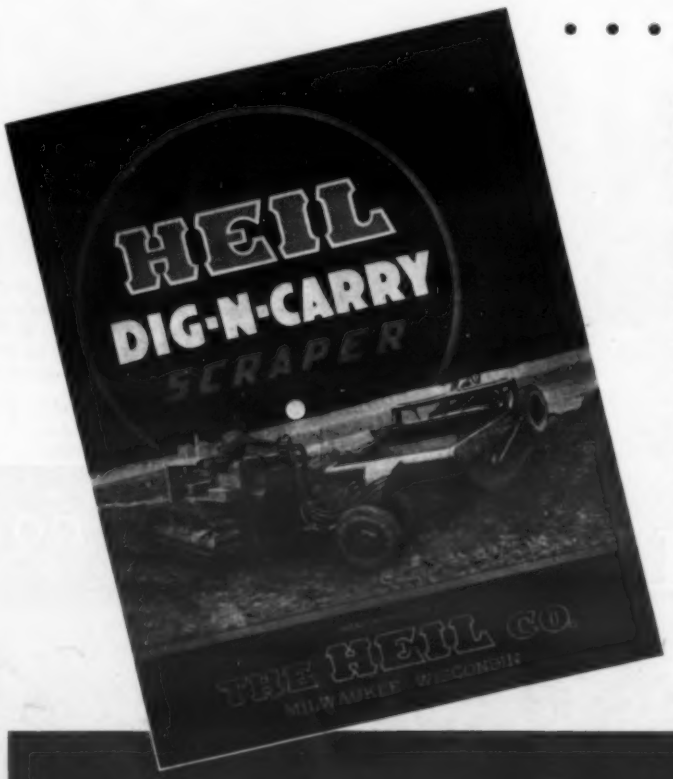


For the Largest and Smallest Jobs

Write for Catalog describing the complete "Conveigh" Line of dependable anti-friction troughing and return idlers, trippers and accessories. They will measure up to the most rigid requirements of the largest as well as the smallest job.

PORTABLE MACHINERY CO.
Division of A. B. Farquhar Co., Limited
BOX C-1, YORK, PA.

. . . . It's Ready!



A new Heil bulletin illustrating and describing Heil Dig-N-Carry Scrapers is now ready for distribution—

Take the time right now to send for your free copy—Heil Dig-N-Carry Scrapers are establishing new, low-cost dirt moving records, thus assuring profits from close margin jobs—Remember—these dependable units are built and backed by a thirty-five-year old equipment manufacturing organization known the world over for the quality of its products—By all means get Heil recommendations before you buy—for complete facts address:

THE HEIL CO.
3000 West Montana St.,
MILWAUKEE WISCONSIN

Branches and Distributors Everywhere

The Buckeye Model 16 Ditcher

A New Utility Ditcher

The Model 16 Utility ditcher, built by the Buckeye Traction Ditcher Co., Findlay, Ohio, has a wide range of service in small trench digging. Mounted on Ford, Chevrolet or other standard truck chassis, the ditcher can be moved rapidly from one location to another at regular road speeds. The truck motor furnishes the power for the ditching mechanism through a special transmission. The motor is supplied with an oversize radiator for better cooling facilities.

Buckeye Alligator crawlers are applied direct to the dual rear wheels. Small detachable idler wheels in front and behind the rear wheels increase the crawler area, thereby enabling the ditcher to work on soft ground. These Alligator traction wheels may be put on or taken off and conveniently stowed away in approximately 20 minutes.

Model 16 is built with the same rugged construction used on the large Buckeye pipeline ditchers. It has a maximum cutting depth of 4 feet 6 inches, a cutting width from 9¼ to 16½ inches, and digging speeds from 1.45 to 15.85 feet per minute.

Complete information on this new piece of equipment will be found in a new bulletin which the Buckeye Traction Ditcher Co., will be glad to send on request to readers of CONTRACTORS AND ENGINEERS MONTHLY.

Rotary Wheeled Scrapers

The Model F Atlas rotary scraper, made by the Atlas Scraper & Engineering Co., 6203 Maywood Ave., Bell, Calif., is designed for use in general excavating, road construction, gravel pits, irrigation work and similar jobs. The construction of the Model F is rugged, the frames being made of rolled structural steel shapes, bars and plates, both riveted and arc welded to assure double strength. The bowls are made of heavy steel plate and shapes, braced and heavily welded throughout. The control bars, levers and links are made of heavy steel sections. The cutting blades are of special alloy high-carbon plow steel and the axles of chrome nickel steel, heat treated.

The wheels, of the extra-heavy drummed type, 8 inches wide for 5F and 6F and 10 inches wide for 7, 8 and 10 F, are set into the back of the bowl to eliminate interference, giving the axles two point suspension instead of cantilevered. The blade cuts a smooth path for the wheels. Two Hyatt roller bearings are in each wheel, together with spacers and dust-tight seal rings.

Atlas scrapers work with any tractor, and no special attachment or mechanical changes are necessary. Two ropes attached to operating levers and leading to the driver's seat control every function. The front lever controls the digging position and the rear lever trips the stop, allowing the bowl to rotate. Three stops are mounted on curved members at the center of the bowl.

A slight pull on the digging lever when the scraper is in carrying position drops the blade to the ground. A pull on the trip lever allows the bowl to rotate to the next stop, which is the digging position. When the scraper is loaded, through a system of leverages, the digging lever is automatically forced back, bringing the blade up to the ground level again, or the drifting position. The load can then be moved to the dumping point. If spreading is desired, pull the trip lever and release it again in order to catch the spreading stop. If complete dumping is wanted, hold the digging lever forward to obtain a complete rotation and release the lever in time to engage the carrying stop again.

The Model F comes in five models, with bowl widths of 5, 6, 7, 8 and 10 feet and moving capacities of 37, 47, 57, 72 and 97 cubic feet.

FIRST
of its Type with 15 Inch Wheels

LaCrosse Trailers were the first to be equipped with the 15 inch wheels and small diameter pneumatic tires which make possible a pneumatic tired job at very little more cost than a solid tired job.

Capacity 5 to 50 Tons

LaCrosse Trailers mean lower operating platform and more pay load. Don't buy a trailer without sending for complete details.

C. R. JAHN COMPANY Funk Building LACROSSE, WIS.

BUCYRUS-ERIE

In Michigan

and all over the country, the 10-B maintains its earned reputation as "the world's fastest selling ⅜-yard excavator." The 10-B tops the field in modern design, tractor-like mobility, traveling speed and operating range; it gets on the job faster, delivers sustained high-speed output, operates efficiently in close quarters, and gives dependable, economical performance in every type of service. Write today for complete information on the 10-B!

BUCYRUS ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT... SOUTH MILWAUKEE, WISCONSIN, U. S. A.

Outdoors and Indoors

DIXON'S TICONDEROGA FLAKE LUBRICATING GRAPHITE

The 50-year old standard of purity and uniformity. To be safe, to be sure of graphite quality, always get Dixon's Ticonderoga Flake Lubricating Graphite—for lubrication, for coating gaskets, packing, as a co-lubricant in oil and grease, etc.; for countless uses on every job. At all dealers or write for Booklet C-148.

JOSEPH DIXON CRUCIBLE CO.
Jersey City, N. J.

Old Timer Suggests a Patching Outfit

(Continued from page 14)

about barricades and motorists abominate them, so invariably a patch, no matter what size, is opened immediately to traffic.

A pre-mix with asphaltic oil binder will require several days to take at least a partial set, and in the meantime it gets pretty well rutted out by cars and trucks.

The "Super" Shoots the Works

"First, I want to tell you that after working with asphalt and asphalt products for some seventeen years, I believe that the cold, liquid form of asphalt, which is prepared in an emulsified form, with water as the carrying agent, presents a better type of binder to use in making up a pre-mix material, but better yet," said Sanderson, "it makes the best binder for penetration patching." He pointed out that this type of binder requires no heating and can be used direct as it comes from the drum or tank car. The grade of asphalt used in the better types of cold emulsion binder is generally either California, Mexican or Venezuelan base with a heavy body and the grades used in the manufacture of emulsions can have a heavier, more ductile and sticky-bodied asphalt than can be produced successfully in the manufacture of asphaltic oil, more commonly termed cut-back.

Patching With a One-Unit Outfit

"Let me tell you just how to build a penetration patch that will stand up and will require the least amount of equipment. In penetration patch work the size of the stone should equal the depth of the patch, so that if you are working in a hole that is 1½ inches deep at the center, graduating down to perhaps ¼-inch at the edge, you should use 1½-inch stone at the center tapered off with smaller stone to where the patch dies off. About three sizes of dry stone are required on a 3-ton truck for convenient patching. The three sizes are: first 1½ to ¾-inch; second, ½ to ¼-inch; and third, ¼-inch to 10-mesh. Where you are making a patch 1½ inches deep, you fill directly on top of the large size with the second size, taking up the voids without raising the elevation of the patch. It is to be assumed that you know enough to spray the surface to be patched with binder prior to placing any stone. Then after the application of the second size, spray the whole thing with binder and rake a light covering of the small size in place and spray again, covering with the smallest size. The work is then ready to be rolled and opened to traffic.

"If the work can stand for one hour or more, prior to rolling, it will take more compression. If the schedule does not permit this, roll it at once, only add more cover material to prevent pick-up on the roller. Patching of this type need not necessarily be held up on account of damp weather, but this does not mean to place material in the rain. It does mean, however, that one-half to one hour after a shower you can go right ahead with the work, as a damp pavement is not a hindrance to emulsion binder. Neither is damp aggregate, and this is of quite some importance when one considers that frequently crews working with heated bitumen are 20 miles from the shop when a shower or two causes discontinuance of the work for the day.

"The surface you get from this type of a patch is comparatively sharp and angular and is preferred for today's high speed traffic as it provides traction and grip for the tires. Don't use fine graded aggregate to form smooth, slick surfaces as it permits cars to skid when the surface is wet.

Hand Spray Outfit

"These hand spray outfits, and there are several different types on the market, costing approximately $75.00 for a complete unit, fill a very definite need in our one-unit patching outfit. First of all this equipment is light, consisting of pump, hose, spray rod and nozzle with a connection to go into the drum of binder. Two men can operate the pump easily and if necessary one can do it. With one man to operate the spray, the unit is ready for work. Now on the truck there will be three grades of stone, several drums of cold emulsion binder, and the spray equipment. Naturally it would be convenient to have partitions in the truck to keep the three sizes of stone segregated. The bitumen and spray should be located at the back of the truck as the spray equipment comes with about 30 feet of rubber hose and a considerable area can be covered in one stop.

(Continued on page 35)

"A MAMMOTH JOB"

All contractors building the gigantic New York City Triborough Bridge selected FLEX-PLANE FINISHING MACHINES exclusively because of their utility. Solving many unusual problems was made easy. Six FLEX-PLANE FINISHING MACHINES, ranging from 10 to 40 feet wide, are engaged in surfacing the concrete runways.

Flexible Road Joint Machine Company, Warren, Ohio

GOHI Corrugated PIPE

gives more highway protection per dollar

Meets copper bearing pure iron requirements in all accepted specifications for corrugated metal culverts.

THE installation cost of a culvert that will endure as long as the highway is no greater than a cheaper structure whose life is limited and service always uncertain.

It is the record of experience that GOHI Corrugated Pipe gives more highway protection per dollar invested. Numerous GOHI pipe installations have been giving uninterrupted service, free from any kind of trouble or upkeep, for more than a quarter of a century. Normally, they outlast the roads under which they are laid. The economy of such service far outweighs any slight possible saving in initial cost.

GOHI Corrugated Pipe is made of GOHI Pure Iron-Copper Alloy, the longest-lasting, lowest-cost ferrous culvert metal produced. You get dependable drainage protection — maximum economy — and add years of life and usefulness to highways when you use GOHI Corrugated Pipe for every drainage need. Full details from nearest GOHI fabricator.

(39)

St. Paul Corrugating Co.	St. Paul, Minn.
The Newport Culvert Co.	Newport, Ky.
New England Bolt Co.	Everett, Mass.
Central Culvert Co.	Ottumwa, Iowa
Capital City Culvert Co.	Madison, Wis.
F. Yeager Bridge & Culvert Works	Port Huron, Mich.
Bancroft & Martin Rolling Mills Co.	S. Portland, Maine
Denver Steel & Iron Works Co.	Denver, Colo.
The Lane Pipe Corporation	Bath, N. Y.
Dixie Culvert Mfg. Co.	Little Rock, Ark.

GOHI

PRONOUNCED "GO-HIGH" CORRUGATED PIPE

GOHI CULVERT MANUFACTURERS, INC., . . . NEWPORT, KY.

SAUERMAN LONG RANGE MACHINES

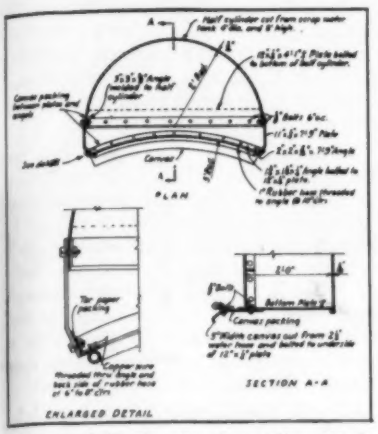
POWER DRAG SCRAPERS
SLACKLINE CABLEWAYS
SLACKLINE SCRAPERS
TAUTLINE CABLEWAYS
SCRAPER-LOADERS

If you have a problem of digging, conveying or stockpiling earth, clay, ore or bulk materials, write for the Sauerman catalog.

SAUERMAN BROS.
464 S. Clinton St. CHICAGO

How the Other Fellow Did It

Ideas Which Have Already Proved Helpful to Contractors



Details of Device for Inspecting Piers Below the Water Line

Subsurface Inspection Chamber

383 An ingenious device for inspecting the condition of a submerged section of a heavy pier was recently developed by J. M. Salmon, Bridge Engineer, of the Louisville and Nashville Railroad. Cracks had developed in the concrete above the water line which necessitated investigation to determine whether they extended below.

The device consisted of a boiler cut in half and equipped with packing to provide a water-tight joint between the boiler and the pier. A 4 x 8-foot boiler was used. One end was removed, and angle braces were installed as shown in the accompanying illustration. Canvas packing was used at all joints except where direct contact with the pier face was made. At that point a 1-inch rubber hose was tied to angles, and a canvas flap was fastened outside of the hose.

In placing, the half cylinder was held against the pier with cables until enough water had been pumped out to cause pressure which stopped leakage. Water was pumped from the cylinder with a 4-inch Pitcher pump, which dewatered slowly until the pressure took effect and stopped leakage.

This device was satisfactory both on flat and curved surfaces of the pier, but it is believed results would be improved where curvature is sharp if a larger hose were used for packing.

Investigation of the concrete showed the cracks extended only a short distance below water level so that what appeared first as a major repair job was, in reality, a minor one. H.O.H.:35

Sand Screens Improved

384 A sand and gravel company working along the Mississippi has solved one of its annoying maintenance problems on such equipment. A sand sucker is used to raise rocks and sand from the river bottom. Discharging from the pump, the water, gravel and boulders pass down a trough. Sand straining screens are placed in the floor of the trough to allow the tons of sand, gravel and fine river bottom silt to drop into a barge below, while oversize rocks, gravel and other debris pass over the screens and fall back into the river. The abrasive action of the water and sand dropping through the screens, as well as the pounding from the larger material, is unusually severe.

Mesh screens of spring steel wire formerly used lasted only about two weeks under this rough treatment. It was also found that these screens clogged up frequently. A new, more abrasion-resistant material was sought and the screens redesigned so that they would last a reasonable length of time without clogging.

With these goals in mind, an ingenious solution was found. It was agreed that in order to obtain a maximum of life in these screens, a material especially designed for severe abrasion-resistant service should be used. One-quarter inch welding rods of Hascrome, made by Haynes Stellite Co., a self-hardening chromium-manganese-iron alloy, were spaced ¼-inch apart, and welded to ⅝-inch support bars with bronze. Three screens were thus built up to the size of the old screens. They were then fastened into the floor of the chute in place of the steel mesh screens and the equipment was ready for use.

After eight weeks' service, the screens were examined and according to the men in charge, were found to be good for another four weeks. The new screens also were found to be 40 per cent more efficient, as they do not clog up as often as the old screens. OT-5:36.

Ingenious Intake for Pumps Used on Concrete Paving Job

385 On a 12-mile concrete paving job in Iowa, the only source of water was a stream spanned by one of the bridges in the project. Two triplex pumps were set up at this point, with a 2½-inch pipe from each pump welded together so that either pump could be operated on the line. The intake for the pumps was a pair of steel drums, one inside the other and both perforated for the upper half of their height in the water.

This was found to be more successful than the first arrangement of a frame covered with screen which quickly filled with sand which got into the pump that was operating and put it out of commission until it was cleaned. 539:35

C. & E. M. Photo

The Pair of Perforated Drums (In Lower Left Hand Corner) Served as a Strainer for These Two Triplex Road Pumps

OUT EARLY

AND OFF FOR THE NEXT JOB WHEN HE IS DIGGING WITH

THE Insley TYPE "K"

¾ YD. FULL REVOLVING SHOVEL

Inter-changeable • Shovel • Trench Hoe • Dragline • Clamshell

Send for CATALOG No. 112—It will tell you WHY!

INSLEY MANUFACTURING CORP.

801 NORTH OLNEY INDIANAPOLIS, INDIANA

CONCRETE VIBRATORS

Air operated vibrators for all classes of concrete construction including Bridge deck slabs, Dams and Locks. Highway pavement and Concrete products.

Write for circulars and engineering data.

MUNSELL CONCRETE VIBRATORS

907 West Side Ave. Jersey City N. J.

BLAW-KNOX Finish-Spreaders for Economical Bituminous Paving

KNOW MORE ABOUT THIS SIMPLE, LOW COST ROAD BUILDING UNIT

The Blaw-Knox ROAD FINISH-SPREADER will spread and finish stone or gravel; hot or cold asphalt—one to fifteen feet wide—half a road at a time. Will lay varying widths on curves fully or partially banked—*with one machine at a fraction of the usual cost.* (Ask Blaw-Knox to send you Catalog No. 1523—"The Blaw-Knox Road Finish-Spreader."

BLAW-KNOX COMPANY, 2067 FARMERS BANK BLDG., PITTSBURGH, PA.

Offices and Representatives in Principal Cities

C. & E. M. Photo
Shear Boards on the North Beach Looking Toward the Pump House and Hog-Box

Quabbin Dike Built By Hog-Box Method

(Continued from page 16)

nected with one of the pump relays so that the control house knew at all times how many pumps were operating in the pond. A floating boom kept trash from these pumps. The trash was removed regularly, using the same boat that was used by the engineers for making the daily cross sections of the dike by sounding. The pipe line from the barge consisted of two pontoon sections and one semi-pontoon section with dredge sleeve couplings and connected to the 24-inch spiral steel land line.

Building the Beach

The beaches were originally started with a 5 per cent grade built up of rolled pervious material up to 8 inches in size. When hydraulic operations were under way a pair of Koehring draglines were used to form levees at the outer edge of the beaches at the ends of the beach lines. A large number of shear boards held in place by iron pins were used near the discharge ends of the beach lines to slow down the velocity of the water across the beaches. The beach lines were moved as necessary by the draglines.

Dimensions and Quantities

Dimensions

Height above lowest ledge	264 feet
Maximum height above valley	135 feet
Maximum depth of water behind dike	115 feet
Length in feet	2,140 feet
Volume of dike above original surface	2,500,000 cu. yds.

Principal Quantities

Item	Quantity
Clearing and grubbing	150 acres
Earth excavation	50,000 cubic yards
Rock excavation for core wall	12,000 cubic yards
Misc. rock excavation	6,000 cubic yards
Pervious foundation embankments	175,000 cubic yards
Rolled impervious core embankments	60,000 cubic yards
Other rolled impervious embankments	85,000 cubic yards
Hydraulic fill embankment	2,100,000 cubic yards
Misc. embankment	10,000 cubic yards
Selected coarse material	100,000 cubic yards
Screened gravel	20,000 cubic yards
Light rip-rap	100,000 cubic yards
Heavy rip-rap	19,000 cubic yards

Night Work and Greasing

For night work, General Electric floodlights were mounted about the borrow pits, along the pipe lines and on the beaches as required by the night foreman.

Greasing of equipment was done at the lunch period of each shift and checked again at the end of the shift on the larger items of equipment, whereas trucks alternated, each having its own particular time to drop out for greasing, gas and oil.

Personnel

The design and construction of the Swift River Project of the Metropolitan District Water Supply Commission is under the direction of Frank E. Winsor, Chief Engineer, with Karl R. Kennison as Assistant Chief Engineer, and Stanley M. Dore as Associate Civil Engineer in charge of design of dams. N. LeRoy Hammond is Division Engineer and P. M. Putnam, Resident Commission Engineer on the Quabbin Dike contract No. 50. The contractor was The Arthur A. Johnson Corp., Long Island City, N. Y., Richard A. Johnson, Vice President and General Manager, C. B. Molineaux, Chief Engineer and C. A. Leighton, Superintendent.

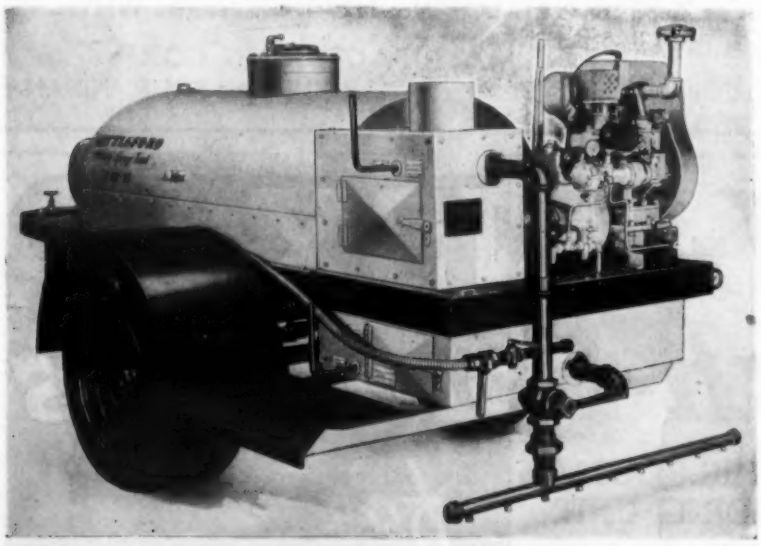
New 12-Yard Scraper

A new model 12-yard Carryall scraper, Type Y, for use with Caterpillar RD-8 tractors, has recently been announced by R. G. LeTourneau, Inc., Peoria, Ill., and Stockton, Calif. In design, this model is similar to the company's former 12-yard model. It is cable-controlled by means of a two-drum LeTourneau power control unit mounted at the rear of the pulling tractor. It uses the same unloading method, a sliding tail-gate to force the material out of the bowl. The cutting blade of 10 feet in width, bowl dimensions and dirt-carrying capacity are the same.

The major change is in the tire size, which has been increased from 13.50 x 20 to 18.00 x 24. The larger tires reduce draft on the tractor and provide a larger ground contact. Four 18.00 x 24 low-pressure tires are standard equipment on the Type Y but duals on the rear and singles in front, or duals both front and rear are optional at extra cost.

To accommodate the larger tires, the front yoke has been heightened, resulting in greater clearance and easier turning. The return spring assembly is housed in the tail-gate itself, and the reserve cable reel is mounted atop the tail-gate, making it handier to pull new cable through the sheaves. The ball bearings in the sheaves are especially designed with a built-in dustproof seal, to insure free rolling cable and long bearing life.

As with the former 12-yard models, Type Y can be operated in tandem behind a single tractor equipped with a four-drum power control unit.



What is the Littleford No. 101 Utility Sprayer?

The answer to that question is this. It is the latest idea in large road maintenance outfits. It is designed to handle any type of tar, oil or asphalt. Because of its size, users buy bulk material saving more than 30% in cost. An elliptically shaped tank is mounted on a heavy duty pneumatic tired running gear having leaf springs; an air cooled engine drives a large pump which fills the tank, sprays (either with hand-spray or the spray bar), circulates for rapid heating or can be used as a transfer pump. Two large oil burners with return type heat flues produce plenty of heat for any material. Sizes 300 to 1200 gallons capacity.

Ask for prices and full details on the size you need.

THE SIGN OF A GOOD ROAD MAINTENANCE LB

LITTLEFORD

Road Maintenance Equipment

SINCE 1900

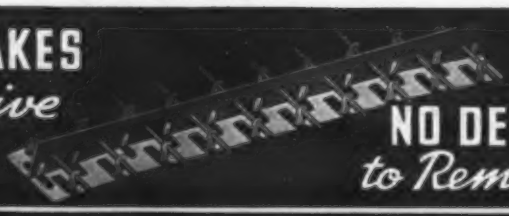
LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

One Man INSTALLS THE WHEELING DOWEL AND JOINT SUPPORT

● The Wheeling Dowel and Joint Support is a one-piece fabricated sheet steel device, ready to place in position. Five are packed in each crate. Simply remove from the crate and distribute along the work where required. One man completes the installation. You save the time required for driving stakes and the time for removing equipment needed by previous methods . . . there are *no* stakes to drive, *nothing* to take out after concrete is poured.

● This new Dowel and Joint Support proved a complete success the day it was introduced. On the basis of savings of delays in operations alone it merits your favor . . . if time on the job means money, save useless delays with the Wheeling Dowel and Joint Support. When cross section, width of slab and total lineal feet of expansion and contraction joints are furnished, quotations can be sent by return mail.

Wheeling

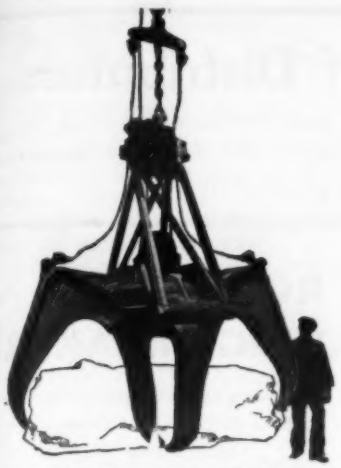


WHEELING CORRUGATING COMPANY

WHEELING, WEST VIRGINIA

NEW YORK BUFFALO PHILADELPHIA KANSAS CITY COLUMBUS, O. RICHMOND

CHICAGO ST. LOUIS LOUISVILLE ATLANTA MINNEAPOLIS DETROIT



The New Owen Type RA Grapple

Tines of New Grapple Have Independent Action

The feature of the new Type RA rock grapple recently announced by the Owen Bucket Co., 6030 Breakwater Ave., Cleveland, Ohio, is the independent action of its tines. Instead of moving simultaneously toward the center in closing, any tine is capable of acting independently of the other three tines. This patented action, obtained by combining toggle-operated tines and arm-controlled tines, causes all four tines to grip any stone, regardless of its shape, with practically equal pressure, according to the manufacturer.

This original action is claimed to make it possible for the operator to place the grapple quickly and easily and to handle great quantities of stone speedily and safely.

Grapples with capacities of from 3 to 60 tons are illustrated and described in a new bulletin just off the press which interested contractors and engineers may secure free direct from the Owen Bucket Co. by mentioning this magazine.

Air-Using Equipment Needs Dirt Protection

Air filters are now accepted as an established engineering requirement for all types of air-using machinery. Under virtually any atmospheric condition, cylinder walls, pistons and other vital moving parts of air compressors, engines, blowers, motors, etc., are exposed to considerable dust, and only a little abrasive matter is sufficient to impair seriously the future operation of the machinery. Dust protection is imperative on construction equipment which is exposed to about the worst dust hazards imaginable.

The new "D" model Protectomotor, made by the Staynew Filter Corp., 17 Leighton Ave., Rochester, N.Y., is built particularly for all pulsating air-using machines such as air compressors, diesel engines, large gas engines, etc. It consists of one or two "D" type filter inserts encased in a circular steel housing with a removable top. It is supported on a strong semi-steel base, threaded for attachment to a standard pipe. Its circular construction conveniently permits direct intake connection, if so desired. Heretofore this model has been manufactured in only two sizes. The increased demand has led to the production of twelve other sizes, making a complete range of these filters in capacities from 250 to 2,000 cubic feet per minute.

Michigan Tool Co. Appoints New Dealer in Southwest

The Brammer Machine & Tool Service, 104 Tulsa Bldg., Tulsa, Okla., has been appointed distributor by the Michigan Tool Co., Detroit, for its line of Mitco cutting tools, cemented tungsten carbide tools, and similar equipment in the territory of Kansas, Oklahoma and northern Texas.

Novel Pile Driver Rig Builds Jetty in Wash.

(Continued from page 2)

point above the floor level of the superstructure, then by means of two right angle elbows into the bottom of a specially designed vertical union. The feeder pipe for the compressor and hammer is brought out of this union straight up to the roof of the superstructure and then carried at right angles over to the tower. The design of the special union or coupling is such that the lower pipe from the boiler can turn in it, as the crane turns, but the upper feeder pipe to the equipment remains stationary. This union can barely be discerned in the picture as the small, vertical object just above the superstructure floor, which resembles a fluted porcelain insulator.

Other Features

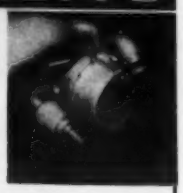
In other respects, also, this jetty job is interesting. The present contract calls for the repair of about 2,300 feet of old jetty and will require the driving of approximately 1,100 18-inch piles. A particular kind of volcanic rock is to be used, obtained from a newly-opened quarry about 80 miles away, as the crow flies, to the eastward and in the vicinity of Mount Ranier. It will be transported from the quarry on cars, first over a 2-mile spur built from the main line to the quarry, thence to railhead on the bay; then on car barges to the jetty trestle, where they will be run from the barges direct to the trestle. No transfer of material will be required from the time the car leaves the quarry until the rock is dumped to the jetty.

New Officers for Simplex

Simplex Wire & Cable Co., of Boston, Mass., has announced the election of Everett Morss, Jr., as President and Treasurer; Charles R. Boggs, Vice President and General Manager; Philip R. Morss, Vice President, Clerk and Secretary; and J. Arthur Gibson, Vice President and Assistant Treasurer. William S. Davis continues as Sales Manager with George L. Roberts, Assistant Sales Manager.

HOMELITE

3-inch Portable Pump



- Handles 15,000 gallons per hour
- Weighs 93 pounds complete with built-in gasoline engine
- Self-priming and automatic
- Handles thick, muddy water and seepage
- Has 28-foot suction lift
- Starts instantly in any weather
- Air-cooled engine won't flood, freeze or overheat

Homelite portable centrifugal pumps come in two sizes: 2" and 3". Thousands are in use. Send for bulletins.

HOMELITE CORPORATION
1007 Riverdale Ave., Port Chester, New York

You Get An Open Type Clutch with the

I-R

Two-Stage, Air-Cooled Portable

SIZES
60A, 105, 160, 210 and 315
(Actual capacity at 100-lbs. pressure)
Gasoline, Oil Engine, or Electric-Driven.

The fourth of a series of five advertisements).

1. Air-Cooled Compressors
2. Independent Cooling Systems
3. "Constant Level" Lubrication
4. Open Type Clutch
5. Timken Bearings

The open type, internal expanding, single-screw adjustment clutch in which the pressure-applying members are relieved of all driving torque strains is standard with I-R Two-Stage, Air-Cooled Portable Compressors. This type of clutch eliminates the many troubles experienced with closed typed clutches.

The open type construction facilitates inspection and adjustment by the operator as required. This care is often neglected where a closed type clutch is used. Due to the wide-open ventilation construction, the engine heat is more readily dissipated than in a closed type clutch.

Write for catalog 3164 today.

MOUNTINGS
Units Less Running Gear, Steel Wheels, Solid Rubber Tires, Pneumatic Tires, I-R Trailer, Two-Wheel Trailer, Motor Truck Mounted.

Ingersoll-Rand 11 BROADWAY, NEW YORK, N. Y.

The Trackson Model 40 Pipe Layer

New Pipe-Handling Unit

The new improved Model 40 Trackson Pipe Layer, designed and built for use with the International Model T-40 Trac-TracTor, recently announced by the Trackson Co., Milwaukee, Wis., will lay pipe on any kind of right-of-way. It is sturdily constructed for fast efficient operation. All control levers are located at the driver's fingertips and operations have been simplified to a minimum.

The side boom is constructed of heavy H-beams with a cast steel header designed for quick attachment and removal of blocks and stiffleg. It is mounted to the rigid tractor frame and pivots on hardened steel, replaceable bearings. The legs of the boom are widespread, enabling it to take side pulls as well as those of lifting and lowering. When the boom has been raised to a vertical position, a safety stop prevents over-throw or bending.

Both the load and boom lines raise and lower under power by means of worm driven winches. A separate clutch and brake on the load line drum allows the load to be lowered without power when desired. A special cross drive transmission permits the load and boom lines to be raised or lowered separately or simultaneously. The Trackson transmission, one of the features of this new unit, provides three speeds forward and reverse on both boom and load lines.

The Model 40 Trackson Pipe Layer is furnished complete with cable, blocks, stiffleg and 2,500-pound counterweight.

New Diesel Engine Has Novel Cylinder Head

The Buda-Lanova diesel engine, made by the Buda Co., Harvey, Ill., uses an unusual type of cylinder head which results in "soft combustion," attained through increased turbulence and controlled combustion. This is accomplished principally through the use of an auxiliary air chamber which, because of its function, is called the "energy cell."

In the Buda-Lanova diesel, the rate of pressure rise is well within the limits of gasoline engine practice. Maximum pressures are not over 625 pounds per square inch. The compression ratio is also comparable to that of a gasoline engine, being between 12.5 to 1 and 13.2 to 1.

The Buda-Lanova Model 6-LD-909 is the most recent addition to the Buda line of industrial engines. The 909 is a 6-cylinder 4-cycle solid injection engine with a 5¼-inch bore and 7-inch stroke, 909-cubic inch displacement, and develops 178 hp at 1,500 rpm and 156 hp at 1,200 rpm.

The crankshaft is 3½ inches in diameter, is dynamically and statically balanced, has seven steel-backed main bearings, which are of the precision type. The combined length of the main bearings is 18⅛ inches, giving the crankshaft ample riding surface. The connecting rods are 14¼ inches from center to center. Lubrication is force-feed to all main, connecting rod and camshaft bearings. Connecting rods are rifle drilled for positive lubrication.

Model 6-LD-909 augments the 6-LD-275, 415 and 468 which have incorporated the Lanova energy cell combustion system for some time. Soon the adaptation of the Lanova principle to all of the large diesels will be announced.

The Buda-Lanova is designed for generator and stationary service as well as for use on shovels, cranes, locomotives, hoists, pumps, crushers, compressors, pavers, rollers and similar equipment.

Typical Kansas Bridge Completed Near Lyndon

(Continued from page 23)

round bars on 12-inch centers along each side of the 10-foot 7½-inch base, as well as 1-inch dowels to which the vertical bars are spliced.

The north abutment footings are of the same dimensions as the south abutment footings except that they are 24 inches thick and founded upon shale. The buttresses and the cross beam for the bridge seat are carried to a height of 32 feet above the bottom of the footing and the buttresses are 11 feet wide at the base and 15 inches wide at the bridge seat, with reinforcements similar to those of the south abutment.

Floor System and Decks

The floor slab is supported by five 36-inch, 150-pound wide-flange steel beams, spliced at approximately the points of dead load contraflexure. The diagrams consist of 5/16-inch plates 30 inches high and 6 feet 5½ inches long, bent into a channel-shaped cross section.

The floor was poured with a 1¼-inch parabolic crown with local ½-inch depressions at the drains. Class A concrete was used throughout the structure except in the posts and rails which are of standard construction. Class D concrete of smaller aggregates was used in posts and rails which had chamfered edges made with ⅜-inch triangular molding. On all other exposed edges of the structure ¾-inch triangular molding was used for the chamfer.

Personnel

The contract for the Marais des Cygnes River Bridge was awarded to the Maxwell Construction Co., of Columbus, Kansas, and Martin Wunderlich Co., of Jefferson City, Mo., bidding jointly, for $26,868.40. C. K. White and Fred White were Superintendents for the contractors; C. B. Lindsay was Resident Engineer for the Kansas State Highway Commission.

Sales Manager Wanted

A company about to engage in the manufacture of an asbestos and cement pipe for water transmission has an opening for a sales manager with contacts and ability to put it over as against cast iron pipe.

Cost 10% less. Suitable for water pressures of 140 to 250 lbs. No corrosion, electrolysis or tuberculation. State qualifications and compensation.

Address Box 192, Contractors and Engineers Monthly, 470 4th Ave., New York.

The Directory of Distributors

appears every other month. The next insertion will be in the August issue. The previous listing of this directory was in the June number. *(See pages 40 to 43.)*

ROCK DRILLS
PAVING BREAKERS

Sharpening and Shanking Tools
Hose Fittings and Hose
Drill Steels
Detachable Bits

The first rock drill manufacturer in the United States announces a new line of Rock Drills and Paving Breakers embodying the latest materials and heat treatments as well as new designs.

HARDSOCG WONDER DRILL CO.
227 S. Benton St. Ottumwa, Iowa

CMC
NEW TWO WHEELERS WITH PNEUMATIC TIRES AND TIMKEN BEARINGS

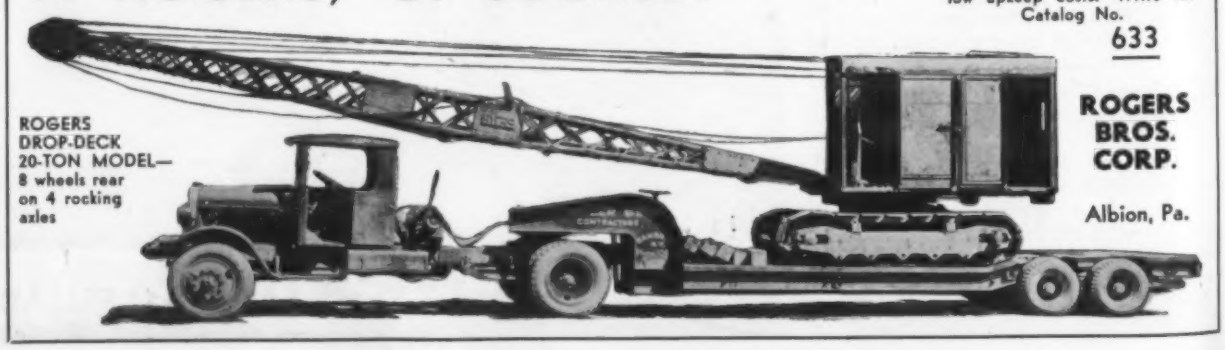
SEND FOR FREE BULLETIN ON THESE LATEST IMPROVED

» 7S and 10S machines or other MASTER and SILVER-STREAK Non-tilts from 3½S to 28S, WONDER Tilters from half-bag to two-bag capacity, also CMC Hoists, Plaster and Mortar mixers, Pumps, Saw Rigs, BETTER BILT Wheelbarrows, Concrete and Material Carts with steel wheels or pneumatic tires. » » » »

CONSTRUCTION MACHINERY CO., WATERLOO, IOWA

A "ROGERS," OF COURSE!

Nowhere else do you find such strength, ease of loading, or low upkeep costs. Write for Catalog No. 633



ROGERS DROP-DECK 20-TON MODEL—8 wheels rear on 4 rocking axles

ROGERS BROS. CORP.
Albion, Pa.

How Cheyenne County Plans Its Road System

(Continued from page 2)

our present state and federal highways as farm-to-market roads, but would rather call them pleasure and commercial highways. True enough, some of our live stock and grain finds its way to market by farm trucks, but this is, generally speaking, in a radius only of about 150 to 200 miles of our larger markets.

Drainage Important

In concluding this short article on Cheyenne County's road system, I wish not to overlook the problem of drainage. I have ever operated on the theory that no road is well built unless it is properly drained. Frequently this phase of road construction is not given nearly the consideration it should have. In this county where the rainfall is comparatively light, drainage is a problem, especially so when operating on a pay-as-you-go basis. And that is the only way I am in favor of building roads. We are all too well acquainted with what the CWA, FERA and the WPA have done to the road funds of many counties.

Tandem-Drive Patrols Added to A-C Line

Two new tandem drive speed patrols, one with 42-hp and the other 54-hp, have recently been added to the Allis-Chalmers line of road machines. Constructed along the trend of modern automotive design, these new A-C tandem patrols have a number of features, including the wide front axle for greater stability, wear take-up provision at all vital points, ball and socket connections, and hydraulic brakes of the internal expanding type.

A complete range of tire equipment is available, including both low and high pressure types in four or eight-wheel tandem assemblies to meet a wide variety of working conditions.

Model 42 weighs 15,350 pounds and Model 54, 17,130 pounds. Speeds range from 2.3 to 10 miles an hour. An extra long blade base allows for maximum effective blade pressure and a huge circle, 5-foot 4 inches in diameter, provides for rigid moldboard mounting and chatter-proof performance.

A gear drive enclosed in an all-welded case transmits power from the drive shaft to the final drive axles.

One of the New A-C Tandem-Drive Speed Patrols

A folder describing and illustrating these new machines may be secured from Allis-Chalmers Mfg. Co., Tractor Div., Milwaukee, Wis., by mentioning this magazine.

New Shovel and Crane Mounted on Small Truck

The new Model 10 truck shovel and crane recently announced by Bay-City Shovels, Bay City, Mich., carries a ⅜-yard bucket when equipped as a shovel and has a capacity of 3½ to 5 tons as a crane. It is mounted on Ford V-8, Chevrolet or International trucks or any other small truck with a 4-wheel rear drive or any 5-ton truck with a single rear axle. The shovel is powered with a 6-cylinder 46-hp Hercules gas engine, a Ford V-8 engine or a Hercules 47-hp diesel.

Standard equipment includes screw jack stabilizers on the four rear wheels to take the load off the springs with a special heavy structural sliding beam type outrigger for heavy lifts or extremely hard digging.

Equipped as a shovel, the outfit has a 14-foot boom and 11-foot dipper stick. The hoist has a single line pull of 6,500 pounds at 156 feet per minute and the crowd is 70 feet per minute. A ½-inch diameter drag cable is used when the outfit is used as a dragline.

The buckets used with this unit are a full ⅜-yard bucket for the shovel with a cast back, nickel chrome front and renewable reversible points. As a dragline it swings any ⅜-yard bucket and also handles any ⅜-yard clamshell bucket. It will readily handle an 18, 24, or 30-inch ditcher bucket and used as a crane it swings a 5-ton hook and block.

Catalog No. 10 recently issued by Bay-City Shovels tells the complete story of this new Model 10 truck shovel and crane.

Changes in Personnel at Morris Machine Works

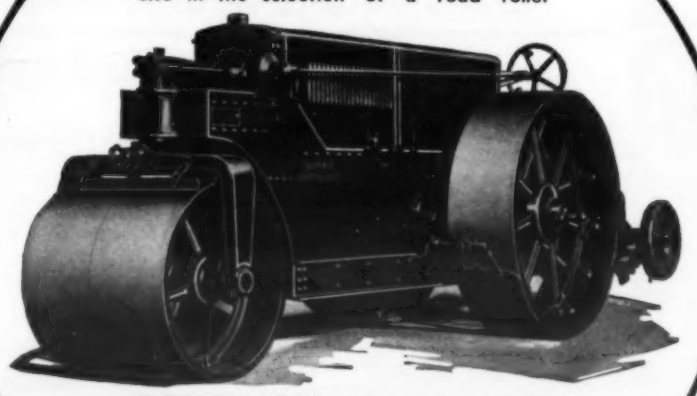
Carl Lager has been elected President of Morris Machine Works, Baldwinsville, N. Y., to fill the vacancy created by the death of Windsor Morris, and Pierce J. McAuliffe has been elected Vice President and General Manager.

Mr. Lager joined the organization as its Chief Engineer 46 years ago and during this period has been a leading factor in the development and application of centrifugal pumps. Mr. McAuliffe joined the company in 1910 as designer of hydraulic dredging equipment.

The Peruvian Congress recently abolished all tolls on roads and bridges in Peru and further provided that all proceeds from gasoline taxes shall, after January 1, 1937, be applied solely to the construction and maintenance of roads, according to a report from the U. S. Bureau of Foreign and Domestic Commerce.

ESSENTIALS

Long life and low operating costs should be considered above all else in the selection of a road roller



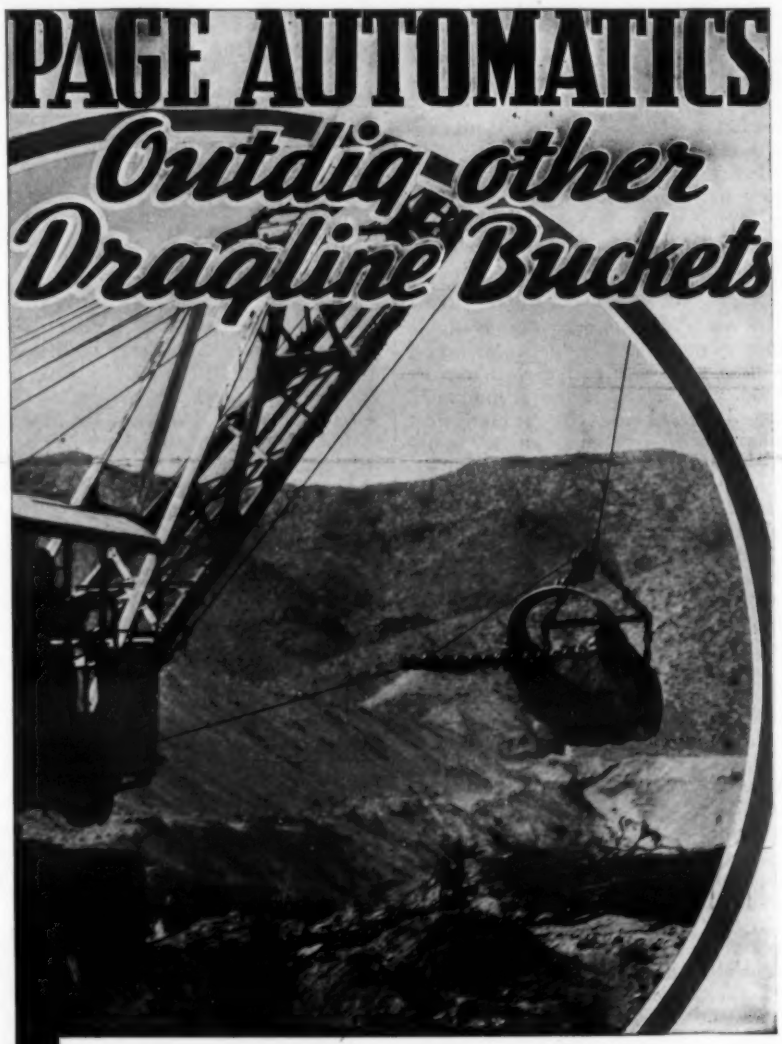
Buffalo-Springfield's ability and reputation for furnishing these essentials have remained unchallenged for

45 YEARS

The Buffalo-Springfield Roller Company
Springfield, Ohio

PAGE AUTOMATICS

Outdig other Dragline Buckets



Here's Proof—

A contractor reports:

**"Since using the Automatic we have been convinced that it has increased our production at least 75%."*

A gravel plant owner says:

**"This bucket has speeded up our operation. It comes up with a full load when working blind under 15 ft. of water."*

A company stripping coal writes:

**"Last winter we purchased an 8-cubic yard Automatic. It has increased our yardage—enabled us to dig harder burden, that we could not dig before."*

*From letters in our files.

Ask owners—operators, they will gladly tell you about their results with Page AUTOMATICS.

BUILT IN SIZES 3/8 to 15 CUBIC YARDS

For information on any particular size AUTOMATIC bucket, see your equipment dealer or write us direct. Address Dept. "N"

"DIG WITH A PAGE AUTOMATIC"

PAGE ENGINEERING COMPANY
CLEARING POST OFFICE CHICAGO, ILLINOIS

Powdered Asphalt with Flux Oil Used

Experiment in Howard County, Ind., Using Variety of Aggregates Provided Satisfactory Low-Cost Road

By GEORGE H. MORROW,
Howard County Surveyor,
Kokomo, Ind.

POWDERED asphalt and road oil were first used in Howard County, Indiana, on the Touby Pike. The road was originally constructed of gravel and crushed stone and compacted by traffic. At subsequent intervals additional material, usually crushed stone, was added as maintenance required. About four years ago traffic had increased to the point where it was deemed advisable to do something more than add stone, in order to prevent expensive upkeep and eliminate dust. It was therefore decided to surface-treat the road, using road oil mulch, cut-back asphalt, and tar surface treatments on different sections. These applications relieved the situation for a time but it was soon apparent that something more substantial would have to be undertaken. It was then decided to improve the road by increasing its thickness, and at the same time build a smooth, firm, and durable wearing surface.

Preparing Road for Surfacing

In order to conserve the available funds as much as possible, local gravel in close proximity to the road was selected. The sieve analysis of the gravel showed that there was an insufficient amount of coarse material to insure proper stability, so a certain percentage of crushed stone, size No. 8, was obtained from the local stone quarry at Kokomo and added to the gravel.

The bituminous material selected to cement and hold the aggregate together was composed of two kinds of asphalt, which, when combined together in the mixing process, produced an asphaltic cement of 250+ penetration. The decision to use that type of cement was made in order to compare its use with cut-back asphalt, emulsified asphalt, road oil, and tars of different characteristics. It was thought that it might be possible to coat more thoroughly and uniformly each piece of aggregate with a film of asphaltic cement, with less labor and construction cost, by using powder and flux oil.

In the construction of Touby Pike, the amount of the flux oil was about 6.1 per cent of the weight of the aggregate and the amount of powdered asphalt was about 2.1 per cent of the weight of the flux oil used. The two kinds of bituminous materials, blended together on the aggregate, appeared to have several advantages. It permitted a wider range in the grading of aggregates, crushed stone, crushed gravel, crushed slag, gravel, sand, limestone dust, and combinations of those materials being used successfully. While the scope of comparisons on this job was too limited to draw any definite conclusions, it appeared that in mixing the aggregates with the oil and powder a uniformly coated aggregate was obtained more speedily than when attempted with an asphaltic cement compounded prior to its application on the road.

The flux oil was first applied to the road by means of a pressure distributor and each particle of aggregate coated with it, and then powder was added to produce the asphaltic cement of the penetration desired, somewhat similar to the process used in the early sheet asphalt pavements in this country. Hard Trinidad asphalt was combined with a flux oil of approximately 250 viscosity to produce an asphaltic cement of approximately 50 penetration, the advantage being that the changes of penetration could be made on the job at the direction of the engineer.

Method of Procedure

The first work on Touby Pike was patching all holes and depressions with a pre-mixed asphaltic concrete, bringing the road surface to a uniform contour and cross-section.

The aggregate for the road consisted of a combination of one-third crushed stone and two-thirds bank-run gravel. The gravel, from a local pit, was put through a crusher so all material passed a 1-inch screen. This gravel was spread on the road through a spreader box in order to produce a uniform windrow. Size No. 8 crushed stone was then added by means of the spreader box in an amount necessary to make a total thickness of 1½ inches. The two aggregates were thoroughly mixed by blading.

The windrow was then placed on one side of the roadway and the opposite half was primed with 0.15-gallon of flux oil per square yard. Being built on an old bituminous base, very little time was necessary for penetration before the windrow was moved onto the treated surface and the other half of the road primed.

The windrow of aggregate was spread in the center of the roadway to a width slightly greater than the reach of the spreader bars of the distributor. Flux oil was applied in two applications of 0.50 and 0.20-gallon per square yard, with mixing between applications, which was continued until the aggregate was thoroughly coated with flux oil and showed a uniform color. The oiled aggregate was spread on the center of the roadway to a width slightly greater than the powdered asphalt spreader, and powdered asphalt was applied at the rate of one-half pound per square yard. Alternate mixing and applying powdered asphalt in one-half pound amounts per square yard was continued until three applications were made. The mixing was again resumed until a visual inspec-

(Continued on page 39)

Littleford Model "C" Distributors All Sizes and Types

All sizes and types of Littleford Model "C" Pressure Distributors are finding increased favor among contractors and highway builders. The reason for this is plain. The Littleford machine is beyond doubt the simplest, most fool proof outfit of its kind on the market. Its applications are accurate. Instant cut-off at spray bars, without dripping, is accomplished by means of a simple arrangement that *does not consist of valves on every spray nozzle.* It has a very economical heating system that heats material faster than any other method on the market.

Ask for prices and information now.

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A brand new Littleford Complete Catalog, series "L," is just off the press. Twenty-four pages of interesting illustrations and worthwhile information show you 93 different Littleford Road Maintenance and Construction Equipment Units. Send for your free copy at once.

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- BLACKTOP TRACTION MIXERS

Write for printed matter
THE PARSONS CO.
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Aids Construction

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BLAW-KNOX CO., 2067 Farmers Bank Bldg., Pittsburgh, Pa.
Offices and Representatives in Principal Cities

Old Timer Suggests a Patching Outfit

(Continued from page 28)

And Now the Roller

"Now, we can get to our last item of equipment which is essential to good patching, and that is the roller. The one I suggest is portable, and is transported on rubber-tired wheels. It would be attached to the front of the truck and is readily converted into a roller by simply lifting the tongue up and over. I think this wheeled-roller which has a drum 36 inches wide by 38 inches in diameter and weighs 2 tons fits into this patching outfit just right, as, with the weight of only 2 tons, it exerts a compression comparable to a 5-ton tandem roller when the wheels are raised and the drum of the roller is on the road ready for use. This weight is ample for any patching and in fact this compression is enough for any type of light surfacing. Many heavy rollers, sitting in sheds throughout the country and in the yards of counties, municipalities and state district headquarters, scarcely move out of the sheds more than once a season because, in the majority of cases, this gas or steam-propelled roller of 8 or 10 tons weight is too heavy for use on general patching work and for the lighter types of bituminous surfacings which are prevalent today.

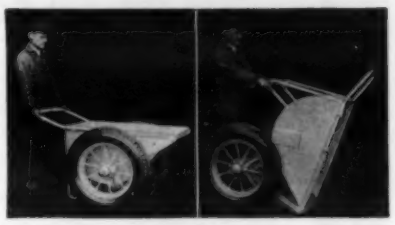
"Rolling in itself is a protection to patch work, inasmuch as the compression brought about on the freshly placed material has a tendency to cause the patch to present a better resistance to immediate usage compared with the material that is shovelled in, raked and left for traffic to iron out.

Maintenance Costs

"Much is said these days about maintenance costs, and the trend towards more hard-surface, dustless roads and highways at a lower cost. This is certainly a step in the right direction, and with this movement I believe will come more definite and more closely analyzed costs of patching. If the one-unit outfit which I have described is studied by anyone interested in the improvement of streets and highways, I think he will see that this combination offers about the most economical outfit that can be devised. Assembling these items into one unit should not require much over an hour and it can travel over the road at 35 to 40 miles an hour, leaving the heavy equipment on the big jobs with no interruption in their work. If you put out six men on a one-unit outfit, you have a cost of about $35.00 per day. If this crew and outfit spend six days in the county on patching work you have an approximate cost on work executed of $210.00, exclusive of the material used. If heavy equipment is called in, as I described before, then the cost will increase from 30 to 50 per cent so it is good business to confine your operations to a one-unit outfit."

The One-Unit Outfit for Shoulders

"Let me tell you one more thing," concluded Sanderson, "not only does this equipment work out nicely for patching, but it will fit in on shoulder surfacing along portland cement roads. Another place that should receive more thought and attention is the point of contact between a gravel road and a concrete surface job. This is always a bad spot, the gravel works over on to the concrete forming poor traction for cars, presenting a ragged condition, and requiring lots of attention for maintenance crews. These places should be surfaced, there are many of them, not only in the county, but in the cities as well. This one-unit outfit of mine would work out nicely for these jobs in paving the approaches some 6 to 8 feet back from the concrete highway. Thus, you see you can utilize this outfit for several different kinds of jobs. God bless you, and let me know when somebody tells you that he put one of these outfits out on the road."



Two Views of the New CMC Dumpover Cart

New Materials Cart

A new CMC Dumpover pneumatic-tired cart has just been announced by the Construction Machinery Co., Waterloo, Iowa. This cart is made in three sizes, 6½, 9 and 11 cubic feet capacities, and the roller-bearing wheels of all sizes are equipped with standard size balloon tires.

By an exclusive development in the construction of the chassis, the entire tray is dumped as far over as needed without the wheels or axle moving from the ground. The manufacturer claims that dynamometer tests have proved that it takes only half the force to move this Dumpover as it does the conventional cart.

Complete details of this recent addition to the CMC line of construction equipment may be found in literature which the manufacturer will be glad to send on request to readers of this magazine.

New Booklet on Power Shovel

The ¾-swing Austin-Western Badger shovel is described in a new 24-page illustrated booklet recently issued by the Austin-Western Road Machinery Co., Aurora, Ill. This booklet not only discusses the features of this shovel but also discusses and illustrates methods of operating on all types of jobs.

Copies of this booklet may be secured by contractors and engineers interested in excavation and dirt moving by writing to the Austin-Western Road Machinery Co., and mentioning this magazine.

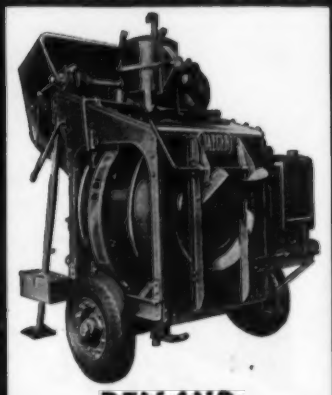
Dustless Highways in Sweden

A total of 16,350 miles of highways in Sweden, or about 32 per cent of the combined length of the roads in that country, was dust-free at the end of 1935, according to a report from the U. S. Bureau of Foreign and Domestic Commerce.

The steady and rapid increase in this percentage since 1929 has been primarily in gravel roads which are treated with hygroscopic salts, of which there were 13,854 miles at the end of 1935 as compared with 10,214 miles in December, 1934. The combined length of the highways on which oil is used as binding material decreased from 490 miles at the end of 1934 to 450 miles at the end of 1935, while that of those treated with sulphite lye increased from 379 to 793 miles.

The building of high-type pavement roads and low-cost bituminous roads has been done on a fairly large scale during recent years, and there were about 620 miles of each type at the end of 1935.

BUYING A MIXER?



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TO

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Mass. Town Builds Low-Cost Roads

(Continued from page 20)

of sand, had made these roads "washboardy," so in the spring of 1929 another experiment was tried. One application of one-third gallon per square yard of retread tar, Mass. Spec. No. 14A, was made and covered with coarse sand, about 35 to 40 pounds per square yard. When completely covered the road was honed, mixing the tar and sand thoroughly and many of the high points of the previous years' applications were cut down. After the honing the road was dusted with a light covering of sand and a brush drag, consisting of about half a dozen fair sized birch trees, was pulled over the road.

Considerable unfavorable comment was made while the first honing was under way, but the following morning comment was very favorable, until the engineer ordered the honing of the day before repeated. The comment was that the engineer must be crazy to spoil the best piece of oiled road they had in town. The following morning showed improvement in riding qualities, but it was considered advisable in some places to hone again. By the time the honing was completed that year, most of the washboard had disappeared. The skeptics admitted the road was much better, but due to the new method of honing, they did not expect the road to stand up through the winter. However, the road came through satisfactorily. The road was treated as in the preceding year, except that it was honed only once or twice, depending on its riding qualities. This was apparently the necessary precaution, for treatment was unnecessary for the next two years. The last application was made in 1934 when one-fifth to one-fourth gallon per square yard of retread tar was used, covered with sand and honed once. This road today gives a smooth ride. Other roads in town have been treated in the same manner, using cut-back asphalt, Mass. Spec. No. 11A, with equally satisfactory results in honing, except that the honing of cut-back must be done in one operation and worked quickly, due to the speed with which it sets up.

Non-Skid Surfaces for Gravel Roads

The latest improvement in maintenance of gravel roads was started in 1934. This was on the gravel constructed roads, which had been treated either with road oil or cold tar, and were somewhat slippery in wet weather. These roads required a surface treatment about every other year and something of a more permanent nature with a non-skid surface was desired. The shape of these roads being very good, it was unnecessary to spend much time on honing. An application of two-fifths gallon per square yard of cut-back tar, Mass. Spec. No. 13, was made and covered with pea stone, using about 50 pounds per square yard, and honed until the stone and tar were thoroughly mixed. The road was rolled once, to set the stone, then covered with a light spreading of pea stone and rolled the remainder of the day and part of the next. This type of construction, illustrated on page 40, has an excellent non-skid surface and it is expected to last four or five years. Adjoining towns are employing this same method of surface treatment, using the same quantities of cut-back asphalt, Mass. Spec. No. 11A, with equally satisfactory results.

Today the Town of Boxford is proud of the work that has been accomplished at low cost, having to its credit 2 miles of bituminous macadam, 2.3 miles of 2-inch mixed-in-place, 5 miles of gravel roads with pea stone cover and 17.7 miles of oiled or tarred road which has been honed.

New Black-Top Scarifier

A scarifier for reworking oil-treated gravel and macadam roads has just been announced by the Austin-Western Road Machinery Co., Aurora, Ill. It consists of a 31-tooth unit, mounted in place of the blade and scarifier attachment.

The depth of the cut is controlled hydraulically from the operator's platform and either end of the scarifier can be raised or lowered independently. This permits operation with all teeth horizontal with the surface or with the teeth set so that the front rows barely scratch the surface, while the rear teeth carry well into the material. An adjustable blade set at the rear of the motor grader makes it possible to respread the material and windrow the excess in either direction. This development is offered for use only with the 77 Senior dual-drive.

Rigid control is assured by the use of hydraulic controls and ball and socket joints at all connecting points. The standard A-W antichatter device holds the circle to the draft beams and prevents play in operation.

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USE
MALL CONCRETE VIBRATORS

Proper vibration with MALL vibrators enables you to use less water and sand, giving a denser, stronger concrete; also, gets concrete in closer bond with reinforcement and eliminates pockets and expensive patching. MALL vibrators do the work efficiently because each is designed for a certain type of job with rugged electric or gas engine power units.

Write for bulletins and give full description of job—depth and width of form, amount of reinforcing steel, etc. We will gladly recommend the type of unit best suited for YOUR work.

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INCREASING construction figures are coming in from all over the country, increased sale of Novo Equipment directly parallels the upward trend of the construction curve—wise contractors are tooling up for profit, with Novo.

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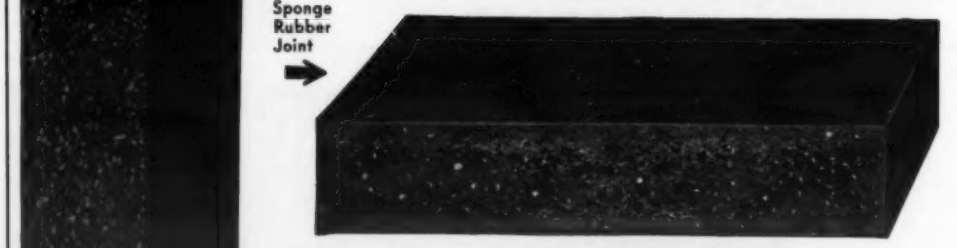

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The Model G Hypressure Jenny

Equipment Cleaning Unit in New Model

The Homestead Valve Mfg. Co., Coraopolis, Pa., which for several years has been making high-pressure spray cleaning equipment known as Hypressure Jenny, has announced its entry into the low-price cleaning equipment field with a new unit for use in cleaning trucks and other equipment, removing tar, grease and oils from concrete floors or highways, removing paint or rust from bridges or other structures, cleaning the walls of buildings and similar work.

This Model G is operated on the same principle as previous models. Cleaning is accomplished by applying, through a nozzle to the surfaces to be cleaned, a combination of water vapor, hot water and cleaning chemicals over a pressure range from 50 to 150 pounds per square inch. The unit is fully contained, carrying water, solution and oil tanks, oil burner, vapor generator, water and solution pump, electric motor and a specially constructed vapor hose with a variety of shaped nozzles.

Vapor pressure is developed by means of a vertical-spiral-parallel-coil type vapor generator, and is controlled by an automatic pressure control switch. The vaporizing oil-burning system burns standard kerosense or light furnace oil. The pilot flame is obtained by manual ignition but is retained automatically after starting.

Both temperature and pressure are held within narrow limits of variation. A safety valve and full nozzle control give the operator complete command of the spray and eliminate danger of damage to the operator or the generator.

A saturation selector enables the operator to change the spray and have a wetter or dryer vapor as needed to obtain the proper effect. Paint thus may be stripped by using very hot water containing a strong alkali; or by adjusting the spray and pressure, tar or heavy grease may be blasted off.

The unit also has a single triplex plunger pump equipped with mechanically operated inlet check valves. This pump is so designed that without interruption it handles water, liquids containing chemicals, sticky fluids, gasoline and oils. In this case, it pumps both the oil to the burner and water to the coils.

Model G Hypressure Jenny is made in both stationary and portable types. The stationary unit is mounted on a platform with legs which allow it to be raised several inches above the floor. Also suitable means are provided for bolting the platform to the floor or other surface on which it is to be set up. The portable unit is mounted on a truck with 10-inch diameter semi-steel roller-bearing wheels, 2½ inches wide. Solid rubber-tired wheels are also provided where required by the conditions of the job.

Hypressure Jenny requires no boiler inspection or licensed operator.

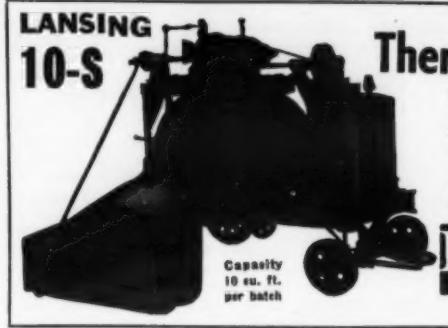
Reversible Ratchet Wrench

A new line of heavy-duty reversible ratchet wrenches, known as the Superector, has recently been announced by J. H. Williams & Co., 75 Spring St., New York City, for use in severe service such as bridge, structural steel and similar work requiring strong fast action tools.

Features of the Superector are quadruple pawls to provide double strength and bearing with increased durability and drop-forged handles to utilize the extra strength afforded by the pawls.

This wrench is made in five sizes, 24 to 48 inches, with both hex and square sockets, with the hole extending clear through, and openings of 1 1/16 to 4⅝-inch. Nuts may be turned on any length bolt.

LANSING 10-S



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Capacity	Model
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⅜ yd. (Trunk Shovel)	10
⅜ yd. (Tractor Shovel)	¾ Circle
½ yd.	30
⅝ yd.	38
¾ yd.	45
⅞ yd.	52
1 yd.	62
1¼ yd.	65

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Take the medium duty range, for example. For 3 to 5 ton loads, there is an array of GMCs whose popularity is proved by registration figures alone. These big, rugged trucks have, first of all, the advanced streamlined styling that buyers have been quick to value. Powerful valve-in-head engines with their many quality features of design assure the performance and economy that are reflected in more trips, more work, greater profits. In fact, everything about these modern GMCs "shouts" engineered-for-the-job design and construction.

Then, too, the new all-steel "helmet-top" cabs, available for these and other trucks in the GMC line, match the chassis themselves in features that contribute to advanced styling, comfort, convenience and long life.

Words fall far short of doing full justice to the great GMC line. Inspection, comparison and test will prove far more.

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Bulletins and Pamphlets

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Portable Diesel Generator Units

750 Complete portable diesel generator units with capacities of 20, 30 and 40 kilowatts have been announced by Cummins Engine Co., 605 Wilson St., Columbus, Ind. These units, which are mounted on skids as well as four-wheel pneumatic-tired chassis, are built for ac or dc current. Complete information may be secured from the manufacturer on request.

A New Rock Grapple

751 The new Owen rock grapple, a feature of which is its four independently-operating tines each of which grasps the rock firmly, regardless of its shape, is described in a circular which the Owen Bucket Co., 6030 Breakwater Ave., Cleveland, Ohio will be glad to send on request.

Idlers and Conveyor Accessories

752 A catalog describing the complete line of Conweigh anti-friction troughing and return idlers, trippers and accessories for conveyors may be secured by those interested direct from the Portable Machinery Co., Division of A. B. Farquhar Co., Ltd., Box C-1, York, Pa.

Free Gas Test of Trucks

753 An economy test of 1936 Dodge motor trucks, made by Dodge Bros. Corp., Detroit, Mich., is available to interested contractors and engineers through the nearest Dodge dealer. For complete information about these trucks and the name of the nearest dealer, write direct to the Dodge company at the above address.

Story of a Compressor

754 The story of a Gardner-Denver 315-foot Caterpillar diesel-driven portable compressor, in use by a western road contractor, which ran 3,500 hours without a forced shutdown, may be secured by those interested from the Gardner-Denver Co., 102 Williamson St., Quincy, Ill.

Curing Concrete with Calcium Chloride

755 The use of Dowflake for a uniform cure and for high-early-strength in concrete is described in literature which the Dow Chemical Co., Midland, Mich., will be glad to send on request to interested contractors and engineers.

Wide Range of Blade Adjustments

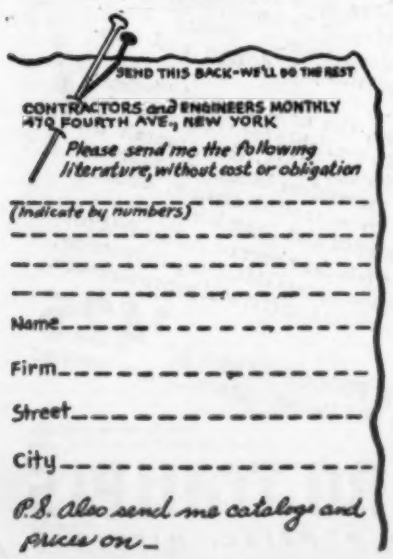
756 This is the feature of the new type of Adams leaning-wheel graders which are described in a new folder which may be secured by interested contractors, state and county highway engineers direct from the J. D. Adams Co., Indianapolis, Ind.

Lights for Night Work

757 Catalogs describing the National Carbide V-G lights, V-G Handy lights and lanterns, which are designed to give daylight conditions on night work, may be secured by interested contractors and engineers from the National Carbide Sales Corp., Lincoln Bldg., New York City.

Complete Lines of Motor Trucks

758 Complete information on the GMC line of motor trucks, in ½ to 15 tons, to meet the varying demands of modern transportation in construction and maintenance work, may be secured direct from the General Motors Truck Co., Pontiac, Mich.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Protection for Roads and Streets

759 The use of a seal coat of Kentucky rock asphalt to protect roads and streets against the ravages of frost, surface water and winter weather is discussed in a new folder which the Kentucky Rock Asphalt Institute, 312 So. Fourth St., Louisville, Ky., will be glad to send on request to interested state and county road engineers.

Handbook of Pipe Jointing Methods

760 A very complete handbook, in ten parts with a leatherette binder, on the subject of pipe jointing methods and containing a large number of tables which enable the contractor or engineer to know at once the exact amount of jute, pipe jointing compound and other materials required for a given job, as well as the latest and approved methods of applying joint compounds and other valuable information, may be secured by interested contractors and engineers from the Berry Asphalt Co., Specifications Dept., 1472 W. 76th St., Chicago, Ill.

Catalog on Power Shovels

761 A new and comprehensive catalog describing and illustrating the complete line of Bay-City convertible power shovels-cranes-draglines in ⅜, ½, ⅝, ¾, ⅞, 1, 1¼-yard sizes may be secured by interested contractors direct from Bay City Shovels, Inc., Bay City, Mich., by requesting Catalog G.

Sand and Gravel Washers

762 Eagle sand and gravel washers, of the screw and paddle types, in sizes to meet the varying requirements of construction work, are described in Bulletin W2 which the Eagle Iron Works, Des Moines, Iowa, will be glad to send on request.

Tents, Tarpaulins and Windbreaks

763 Complete information on the Fulton line of tents, tarpaulins and windbreaks may be secured by interested contractors and engineers direct from the Fulton Bag & Cotton Mills, Atlanta, Ga.

Power for Construction Equipment

764 Hercules Motors Corp., Canton, Ohio will be glad to send on request complete information on its complete line of power plants, from 4 to 200-hp, both gasoline and diesel types, for powering heavy-duty construction equipment.

Two-Speed Rear-Axle Trucks

765 Complete information on International two-speed rear-axle motor trucks, which provide both high-speed and low-speed performance in one unit, may be secured direct from the International Harvester Co., Inc., 606 So. Michigan Ave., Chicago, Ill.

Diesel Engines and Lighting Plants

766 Witte Engine Works, 187A Oakland Ave., Kansas City, Mo., will be glad to send to those interested complete information on Witte 5 and 10-hp diesel engines and 3 to 7½-kw ac or dc diesel lighting plants.

Pebbles on Parade

767 This is the title of an interesting, well-illustrated booklet describing the Grand Coulee gravel plant and aggregate handling equipment recently issued by the Jeffrey Manufacturing Co., Columbus, Ohio. Copies of this booklet may be secured direct from the company by mentioning this magazine.

Heavy-Duty Trailers

768 C. R. Jahn Co., Funk Bldg., LaCrosse, Wis., will be glad to send to those interested complete information on LaCrosse heavy-duty trailers which are made in a range of sizes to meet every transportation problem from 5 to 50 tons.

2 HIGH SPOTS IN WIRE ROPE MANUFACTURE

● Purple Strand—in itself—is an unusual rope where extreme strength is required

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● Where *Pre*formed suits your requirements better, "Form-Set" Purple Strand—Williamsport's method of *pre*forming—will give you remarkable service.

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Data on Spiral Welded Pipe

769 Bulletin No. 101, containing 60 pages of data and illustrations of Armco spiral welded pipe, including its uses, methods of joining, coatings, standard or special fittings, installation in the field and general specifications, may be secured by those interested from the American Rolling Mill Co., Pipe Sales Div., Middletown, Ohio.

Air Filters for Dust Protection

770 Staynew Filter Corp., 17 Leighton Ave., Rochester, N. Y., will be pleased to send complete information on the new Model D Protectomotor built particularly for all pulsating air-using machines such as air compressors, diesel engines, large gas engines, etc. which protects these machines from dust hazards.

The Place of the Roll Crusher

771 Form 514 recently issued by Pioneer Gravel Equipment Mfg. Co., 1515 Central Ave., Minneapolis, Minn., describes in great detail the service of roll crushers as secondary crushers for the economical production of large capacities of small crushed material, using either smooth shells or corrugated shells.

Tracings Reproduced Same Size or Varied

772 County and state engineers and contractors will be interested in the literature of the Lithoprint Co. of New York, Inc., 41-43 Warren St., New York City, describing the Lithoprint process which makes it possible to reproduce tracings and maps to the same scale or larger or smaller scale on paper, tracing cloth, drawing paper, map cloth, etc., in sizes as large as 54 x 180 inches in one piece.

Concrete Vibration Methods

773 This is the title of a new folder issued by the International Vibrator Co., Division of the International Steel Tie Co., Cleveland, Ohio, describing the use of the International method of vibrating concrete in laying and repairing street car track paving, concrete highways and in bridges and buildings. Copies of this folder may be secured from the company upon request.

Crushing, Material Handling Equipment

774 The complete Universal line of rock crushing and material handling equipment, in a variety of sizes and types to meet the needs of every job, large or small, is described in literature which the Universal Crusher Co., 620 C Avenue, W., Cedar Rapids, Iowa, will send on request.

Pictorial Review of Paving Equipment

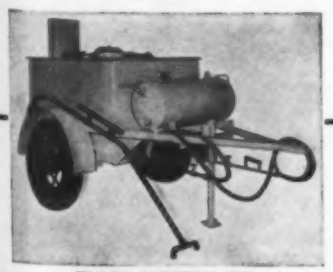
775 Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, has recently issued a 56-page booklet on Jaeger-Lakewood paving equipment, which contains over 100 interesting action pictures of modern road building with Jaeger equipment, as well as descriptions of the various machines. Copies of this booklet may be secured free by writing direct to the company and mentioning this magazine.

Electric-Driven Portable Compressor

776 The Ingersoll-Rand two-stage electric-driven air-cooled portable air compressors which have recently been added to its line of gasoline and oil-engine-driven compressors, and which are driven by either ac or dc motors, available in five models and numerous types of mountings, are described in Bulletin 2198 which may be secured from the Ingersoll-Rand Co., 11 Broadway, New York City.

½-Ton and 1½-Ton Trucks

777 A new illustrated booklet describing Chevrolet ½ and 1½-ton trucks, with a variety of bodies to suit the varying needs of contractors, state and county highway departments and municipal departments, has recently been issued by the Chevrolet Motor Co., Detroit, Mich., who will be glad to send copies on request.



TAR KETTLES
Fire Proof—Oil Burning
Hand and Motor driven spray. Many sizes. Write for catalog.
White Mfg. Co.
ELKHART INDIANA

County Experiments in Low-Cost Roads

(Continued from page 34)

tion showed the mixture to be thoroughly completed and uniform in color.

The bituminous mixture was spread to grade and cross-section, using both a grader and motor patrol. A small amount of covering aggregate, approximately 15 pounds per square yard, was applied, tail-gating it from trucks, and the surface rolled with a 10-ton three-wheeled roller.

Traffic was not kept off the road entirely during construction. However, signs were erected at the end of each day's work.

Costs and Results

The cost of construction of a 1½-inch compacted thickness including flux oil, powdered asphalt, gravel, stone, blading, rolling, and finishing amounted to $0.22 per square yard. Cost of the bituminous cement was approximately the same as other types of bituminous construction of like thickness and aggregate grading. Possibly the combining of aggregates and bituminous cement was accomplished in less time and with less expense by the use of flux oil and powdered asphalt than might have been the case had other types of bituminous cements been employed.

The road has now been in use almost a year and gives every evidence of becoming one of the best bituminous roads in Howard County.

From a paper presented at the Twenty-Second Annual Purdue Road School.

Since a widening program was started in 1933, Indiana has extended the shoulders on 887 miles of highways and has widened several thousand culverts and bridges.

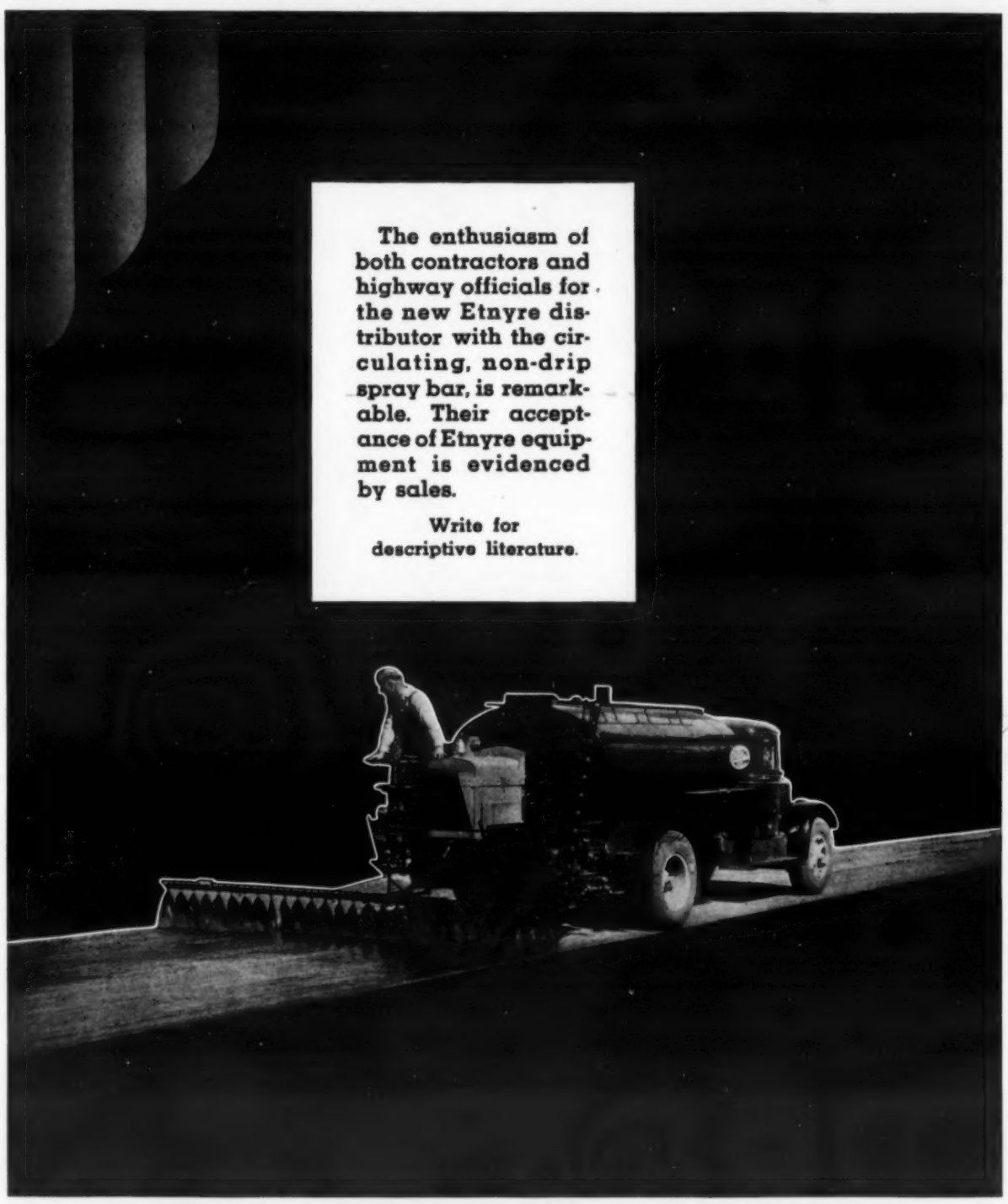
Hough-Universal Road Sweeper Used in Fleets of From Five to Eighteen by 27 State Highway Depts. and by Over 50 Bituminous Paving Contractors.

Powered by its own Engine

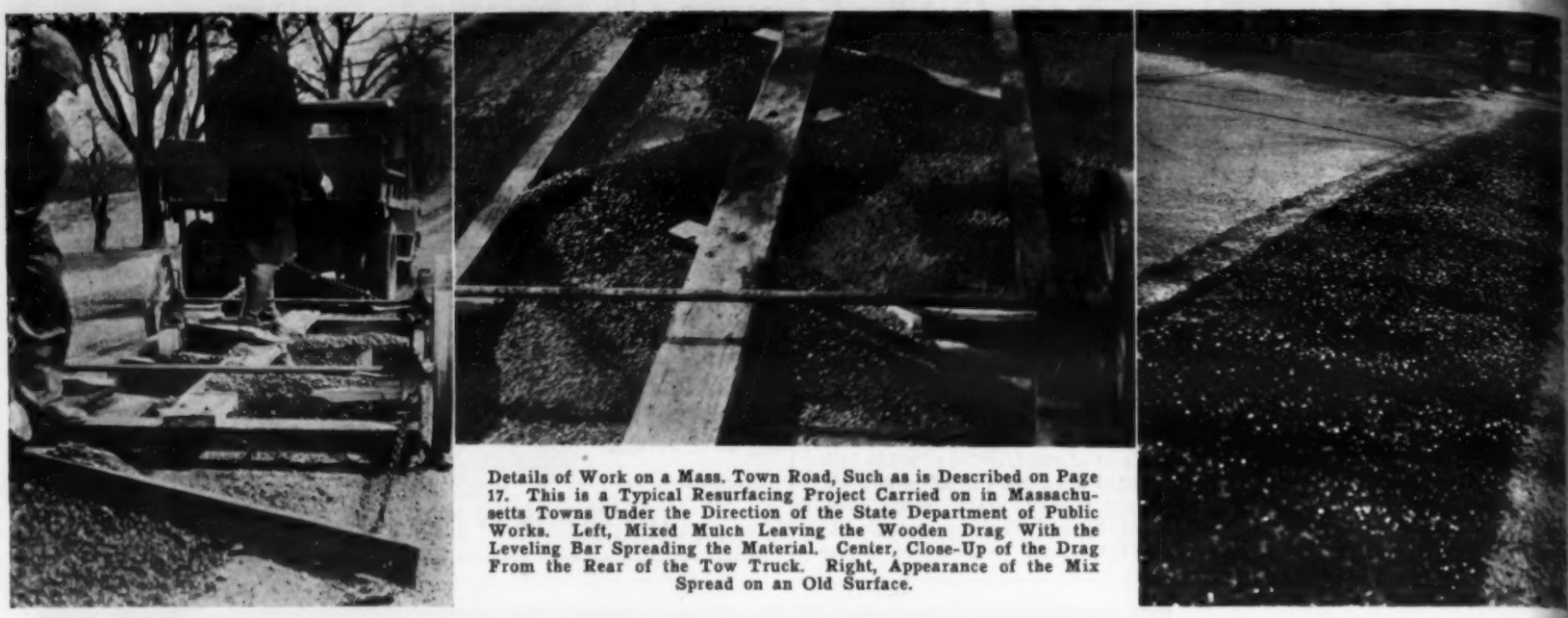
Manufactured by
THE FRANK G. HOUGH CO.
919 N. Michigan Ave. Chicago

The enthusiasm of both contractors and highway officials for the new Etnyre distributor with the circulating, non-drip spray bar, is remarkable. Their acceptance of Etnyre equipment is evidenced by sales.

Write for descriptive literature.



E. D. ETNYRE & CO.
DEALERS IN ALL PRINCIPAL CITIES
400 JEFFERSON ST., OREGON, ILL.



Details of Work on a Mass. Town Road, Such as is Described on Page 17. This is a Typical Resurfacing Project Carried on in Massachusetts Towns Under the Direction of the State Department of Public Works. Left, Mixed Mulch Leaving the Wooden Drag With the Leveling Bar Spreading the Material. Center, Close-Up of the Drag From the Rear of the Tow Truck. Right, Appearance of the Mix Spread on an Old Surface.

Scene: Western Asphalt Paving Corp. Road Job at Verdon, Nebr. Cast: Allis-Chalmers LO Tractor Hauling an Elevating Grader, Shown Loading One of the Five A-C 7-Yard Hauling Units on the Job.

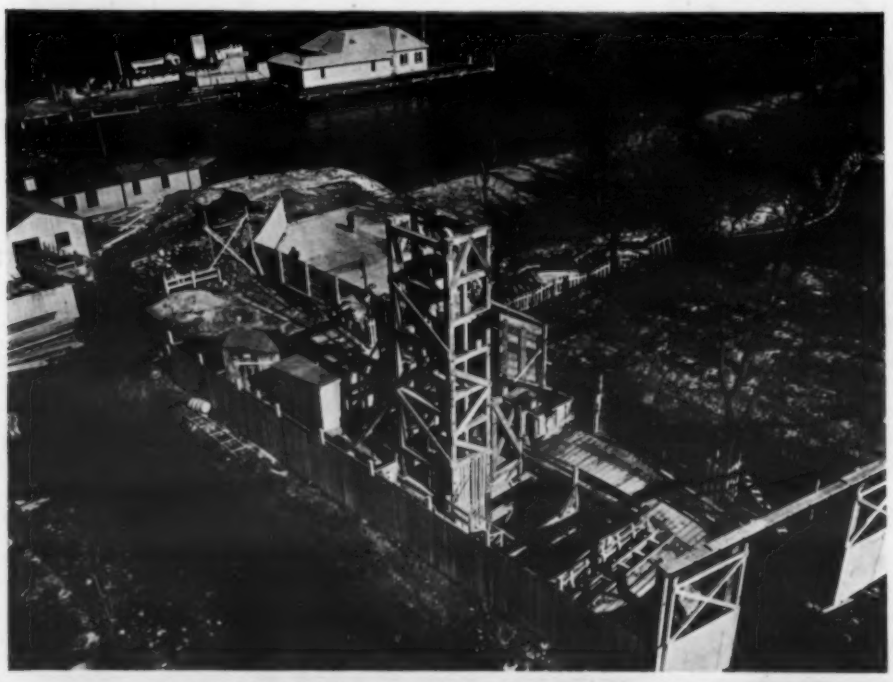
C. & E. M. Photo

The Marais des Cygnes River Bridge South of Lyndon, Kans., Built by the State Highway Commission. See Page 23.

C. & E. M. Photo

"Seben,—Come 'Leben! Baby Needs Shoes!" A Moment of Recreation on a Paving Job.

As a Driver Sees It. The Sodium Vapor Light Installation at Pompton Lakes. See Page 19.



The 89th Street Shaft of Rosoff Tunnel Corp.'s Intercepting Sewer Contract, N. Y. C., and the Track Layout at the Base of the Shaft. See Page 7.